

ANIMAL TECHNICAL RESCUE TECHNICIAN



STUDENT MANUAL

*July 2017
Edition*

Introduction

Large animals may present an extreme range of speed and force. This Operational/Technical level course will provide background knowledge and skills to allow you to more safely and successfully respond to the low frequency and high-risk Animal Technical Rescue (ATR). The success of ATR responses can depend on subtle nuances, and how the animal thinks and reacts. The dangers of ATR lie in the extreme range of responses that we might encounter, and our imperfect control of the animal, the scene and ourselves.

The success of ATR can depend on our ability to organize what could be a highly charged, emotional scene, in challenging terrain, in difficult weather, by applying the following concepts and techniques.

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The Cadre for Animal Technical Rescue

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Table of Contents

Acknowledgements.....	3
Special Acknowledgements	4
Chapter 1 – Introduction and History of ATR.....	2
Chapter 2 – Animal Anatomy and Physiology.....	4
Chapter 3 – Safety and Approach	11
Chapter 4 – Patient Management.....	17
Chapter 5 – First Aid.....	24
Chapter 6 – Scene Management.....	31
Chapter 7 – Physics	40
Chapter 8 – Raising and Lowering.....	54
Chapter 9 – Vertical Lifting and Helicopter.....	68
Chapter 10 – Mud, Water, and Ice Operations.....	86
Chapter 11 – Animal Decontamination	98
Chapter 12 – Small Animals	105
Chapter 13 – Euthanasia	111
Chapter 14 – Recovery	119
Resources.....	122
Strapping.....	124
References	125
NFPA Correlation.....	127
Acronyms & Abbreviations	131

Chapter 1 – Introduction and History of ATR

At the end of this topic, a student, given ATR response guidelines, industry methods for moving animals in commerce and war, will be able to describe and implement rescue skills, so that technical rescue skills are administered following time tested, standardized concepts that lay the foundation for rescue applications.

Tony Stromberg, in his book Horse Medicine, notes that “the horse has been an intimate part of human evolution for millennia”, a bond that arose out of a mutual dependence on one another.

This connection is manifested at its best with willing partnerships that can connect the human



Wikimedia cc WW1

to the essence of an increasingly distant primal world, devoid of cell phones and politicians, and a journey of self-discovery. It is this fascination with horses that keeps them relevant and involved with our lives today through recreation, livelihood, and service.

At its worst, mutual dependence was swayed by exploitation of the horse. For just cause, the exploitation of horses reached a peak during WW1 where 480,000 horses died pulling artillery and carrying cavalry. Many of these horses were imported from the United States for duty. In fact, one of the reasons that Germany lost the war was because it did not have the ability to import horses from abroad and so ran low on pulling power for artillery. Import from the U.S. involved lifting and lowering onto and off of transport ships.

This ATR body of knowledge grew out of the little town of Felton CA, where new and inexperienced riders chased their lifelong dreams of horse ownership and ended up on treacherous trails in the dramatic landscape of the Santa Cruz mountains. A few beers ahead of time at the local bar are sure to calm the nerves.

Felton Fire fighters quickly recognized that this demographic of “green rider” and often “green horse” brought challenging incidents that Fire Fighter Academy did not prepare them for.

But FF academy did provide them with transferable skills in the form of vehicle extrication, useful with trailer accidents, rope rescue, useful for over the side incidents, swift water rescue for river rescues, trench rescue for ditches and ravines, and medical skills for the riders. In the end, Felton FPD, led by John Fox, and with approval of Chief Ron Rickabaugh, realized that they could apply these skills with an understanding of horse behavior and characteristics to safely and effectively resolve these incidents.



Photo Jan Jensen, Mule into Mine

Historic inspiration came from other cultures, and the earliest reference to animal rescue was found in the Bible Luke Chapter 14 verse 5 “Which of you shall have an ass or an ox fallen into a pit, and will not straightway pull him out on the Sabbath day?” Packaging concepts for High Angle rescue came from historic photos of miners lowering mules into the mine shaft for work.

Examples of emergency slings for remote rescue were found in a rare book illustration by Frederick Remington of the donkey “El Sabio” being lifted across a ravine. An updated version of this tie constructed out of wildland fire hose has saved the lives of many horses.



Photo Buffalo Bill Center, Loan from Bob & Angel Coe Frederick

This class focuses on the species **Equus**. ATR is a set of transferable skills that are taught in the context of large animal because it is the heavier, more dynamic, and challenging species. However, ATR skills can be adapted for small animals with nuances, and that will be covered later on. For exotic primates, human rescue technique may be applicable.

The material in this study should give students the ability to conduct 95% of the rescues they go to using standard equipment available on a normal type 1 engine available anywhere in the country.

As a reminder to firefighters, horses were used in the fire service from 1832 until the 1920's. Their speed and power propelled heavy pumpers, hose carts and ladder wagons from the station to the fire at breakneck speed, improving response times. Fire fighters were initially reluctant to have horses in the station, but soon appreciated their horses as companions and trusted partners. Bred as coach dogs Dalmatians had the stamina and speed to keep up with the horses. Their bark served to clear intersections of moving obstacles since it was difficult to stop the heavy equipment. Once on scene, the Dalmatians helped to calm the horses and guard equipment while the fire fighters fought the blaze.

ATR provides help for valued animal partners and their owners.

Photo CSFA Dave Hubert & Jimmy Glynn Driving Brady, Major & Jim



Chapter 2 – Animal Anatomy and Physiology

Terminal Learning Objective (TLO): At the end of this topic, a student, given animal descriptive nomenclature, physiological systems, descriptive animal systems, and rescue equipment, will be able to describe application of equipment and monitoring life signs of animals in threat, so that vulnerable areas and systems of equine/animal skeletal structure are monitored and consider anatomical features for equipment placement, to assist the mobility of ambulatory animals or implement rescue measures to abate hazards with maximum safety.

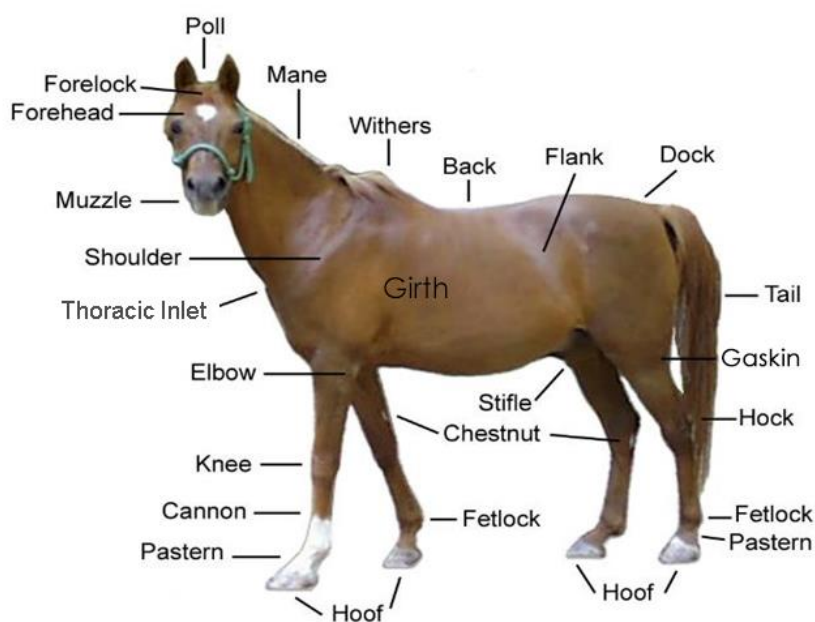


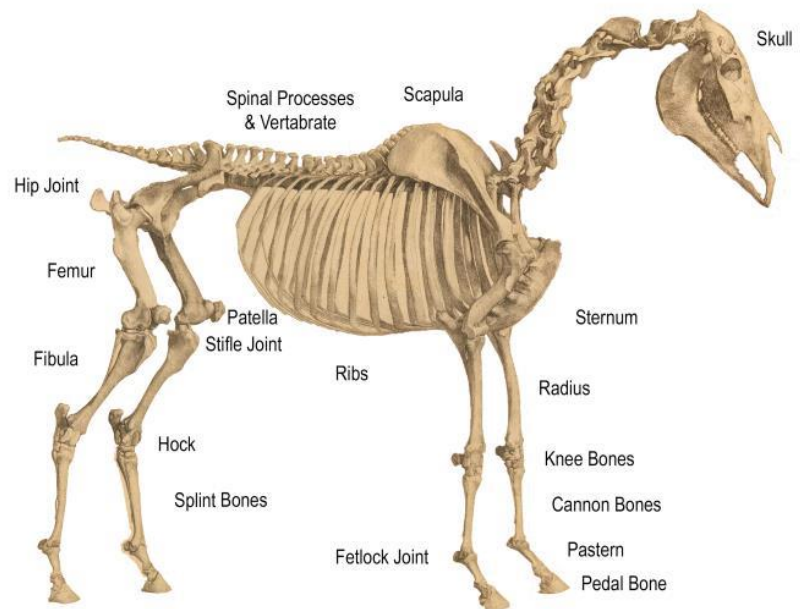
Photo Debra Fox

Common Terms

On scene, we may need to refer to some particular part of the horse to describe an injury or for placement of equipment. Some of the more commonly used terms are the **poll**; a vulnerable part of the skull, the **Mane**; a possible assist for movement of the head/neck, the **withers**; where the point of the **scapuli or shoulders** come together and can help

stabilize a rescue strap, the **flank**; a depression behind the ribs that serves as a pathway for application of the rescue strap for a rear haul, the **dock**; the place where a half-hitch can stabilize a vertical lift tie, the **gaskin**; a contour of the back upper leg, that can serve as a purchase for strapping to move a recumbent horse, the **stifle**; which can become locked causing the leg to be fixed straight out, the **pastern**; that can support a soft wrap for a limited amount of time to control a leg, the **cannon bone**; a location on the limb where we avoid the placement of equipment to avoid pressure on delicate tendons and ligaments, the **hocks** which support the horse when he is going uphill, **thoracic inlet**; a soft depression over the airway that we must not put pressure on, and other obvious terms like hoof, tail, etc.

The skeleton of the horse is a wonder of evolution and engineering. It provides the fortification to protect the vital organs and the structure to support and carry a thousand pounds into flight while balancing on four “stilts”. The backbone is a flexible horizontal member that carries the load of the internal organs. Aided by massive ligaments and musculature, the body can flatten for speed, or collect for power. The cervical vertebrae curve down from the head to a balance point where the



Metropolitan Museum of Art, George Stubbs

This arrangement gives the neck impressive range of motion that is critical for balancing and gaining momentum. The sternum is sort of like a linear ‘gathering plate’ for the ribs on each side and serves as a support for rescue equipment. It is located central to the front of the horse, in an ideal place to carry the load of 60% of the horse.

By looking at the skull, we can see vulnerable areas. Consider the occipital bones that are light in structure compared to the rest of the skull. A horse that is trapped will attempt to swing its head for momentum to get up, and in doing so may fracture these bones. The hard “**poll**” at the top of the skull provides dense protection for the brain, but if sufficient blunt trauma is sustained, it can break the **occipital** bones and damage the brain. The brain case itself is constructed of paper thin bone that affords little protection for the brain from the front of the skull. Horses with a large forelock have padding that could help. The head has fair range of motion in up down movement. But it is limited with side to side movement by the ligament that joins it to the **C1** vertebrae. Sideways movement of the head is achieved by swinging it with the neck. The horse uses the neck and head for balance and impulsion!!!!



British Academy George Stubbs

The back view of the skeleton gives us an idea of the volume of massive organs and weight load. It also shows us that there are vulnerable areas that are not protected by the ribs. Where

possible, we should apply strapping and slings where they will be supported by the skeletal structure. Note the boney protrusions at the hips and the shoulders that can provide stability for our strapping and slings.

Differences between Bipedes and Quadrupeds complicate straightforward medical tasks like packaging. People are symmetrical so we can put them on their back, secure them in place and transport them. With horses, we need to place them in lateral recumbence on a backboard. By doing so, we have a “hoof” side that is dangerous to work with, we have an unbalanced load, and we have a big heavy body that no matter how it is tied onto the board wants to slide off with the pull of gravity in a high angle situation. **See packaging.**

Moving a heavy load, mandates finding the center of gravity for equipment placement.

The girth area happens to be the center of gravity!!!! Will we break ribs if too much pressure is applied here? Possible, but the rib cage here is substantial and tied into the sternum for support. Will we impair the horse’s breathing by constricting this area? Not likely since there is very little expansion of the lungs in this area.

It would be wrong to assume that we could just grab onto the limb or the head of an animal and use them as handles. As bi-peds, our human arms can be used as handles. We can pull on a person’s arm because our arms are stabilized with clavicles that act as “struts” and are “hard wired” to our skeleton.



Horses are quadrupeds, built to be upright, built for speed with every limb involved in locomotion. Clavicles would interfere with this design. Horses, cows, sheep and pigs are among animals that do not have clavicles. Here’s what it does for them; let’s look at a horse galloping, it is said that the concussion of each hoof hitting the ground can be as high as 4,000 lbs. per square inch! The horse’s front legs are designed to act as giant shock absorbers to absorb that concussion, thus protecting the skeletal structure. This is only possible because the front leg system is not “hard wired” to the skeleton, but floats in muscle and soft tissue. That floating scapula acts as an extension of the front leg to give the horse increased stride. While the legs are rated from the ground up for 4,000 lbs. per square inch, a single leg is not rated for pulling the weight of the body, and could detach.

Metropolitan Museum of Art, George Stubbs

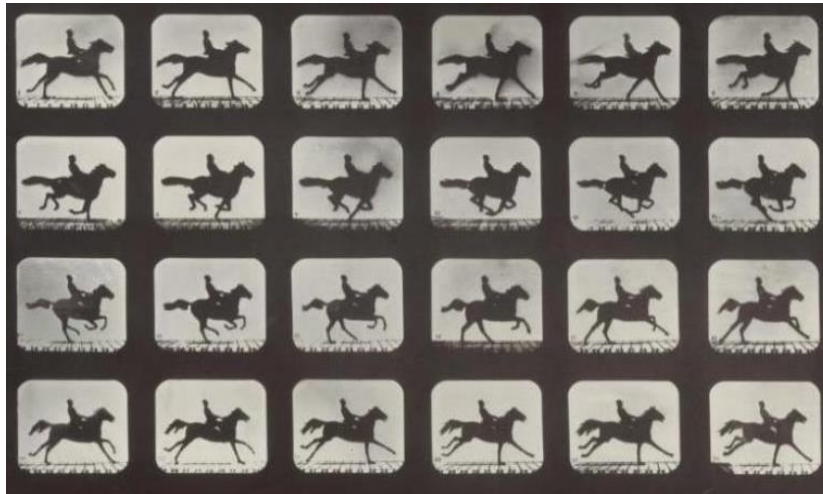
The hind legs seem to be slightly more stable in that they are jointed to the pelvic girdle. But the hind leg system is designed for specific movement. It is so specific that when one joint is flexed, all the joints in the

leg flex. This system helps to fold the leg like a mechanical lamp or an engineer's ruler, and stores power for a release that propels the horse through the air, or, a kick out. The problem with using the hind legs for handles for pulling the horse, is that the legs are not designed to have a load on them, and they could hyperextend. Horses hyperextend when galloping or kicking, but this is a brief moment, not sustained in that position, and there is no load on them. Note the **stifle** joint at the knee, this is the site of a ligament that slides into place to stabilize a horse that is sleeping while standing. Occasionally with rescue of a recumbent horse, the ligament can become stuck in that groove. If this happens the affected leg will stick out and complicate packaging for transport through a tight space. To release the ligament from the stifle joint, flex the hoof joint and the rest of the joints should reciprocate and also flex.



This series photographed by Eadweard Muybridge shows

Metropolitan Museum of Art, George Stubbs

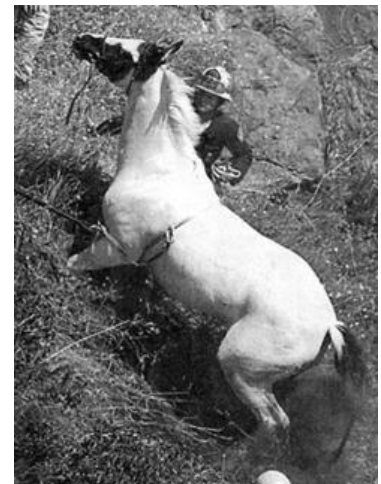


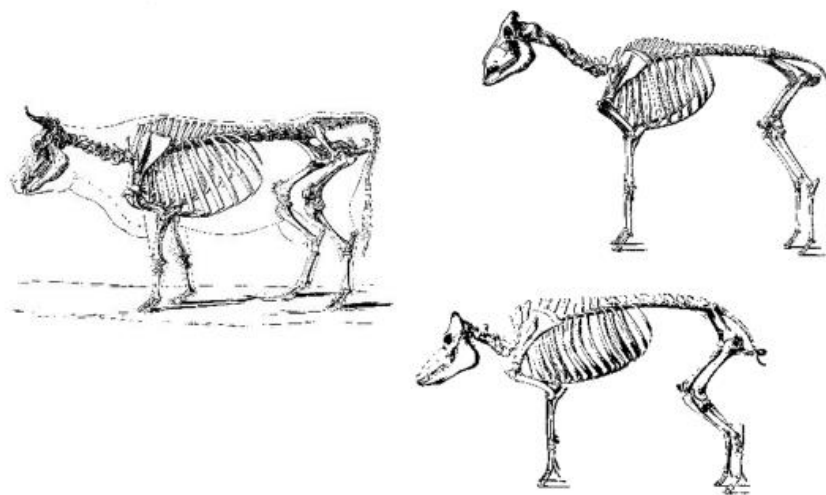
Eadweard Muybridge **Animals in Motion**

the action of the front and hind leg systems clearly. It is also evident how the back legs can push the lungs like a pair of bellows for maximum air flow. The horse leaves one foot on the ground if the front and hind legs are extended. If the front and hind legs are contracted, the horse "flies" off the ground.

When going uphill, the weight of the animal puts additional load on the hocks and stifle joints. Expect the horse to leap or bound uphill to relieve the strain.

Photo L.A. County





Copyright Andrew Clifford 2009

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Pigs and horses get up front first, but some animals get up hind first. These include cows, sheep and goats and that is how we should assist them, hind end first.

The skeleton tucks in at the girth. This works out nicely for the outboard front legs of a mobile horse as they slide back and forth in locomotion. The girth serves as a pathway for application of strapping. Our tool can slide more easily under the horse here. We call this a path of least resistance, or, the **"Front Door."**

Likewise, the body is tucked in nicely in front of the hind legs, giving them clearance as they move back and forth. This flattened area, between the rib cage and the hind legs, serves as a pathway for rescue strapping, or the **"Back Door"**. Because the front legs are outboard from the skeleton, they serve to stabilize a rescue strap located at the girth, in the same way they do a saddle. Because the hip bones are located outboard from the body, they serve to stabilize the strapping at the Back Door.



Front Door

Back Door

Photo LAR Co.

These applications may need to be supplemented with keepers or chest/butt plates when used in certain configurations.

The anatomy of the animal is going to determine the equipment placement and the amount of time that they can be down.

While the skeletal structure gives support and security to rescue strapping, there is a blanket of nerves between the skin and the skeleton that can be damaged with too much pressure for too long. Strapping is best supervised by the veterinarian who is familiar with nerve bundles that should be padded out, or avoided.

The Golden poodle on the left has more protection for his nerves, muscle and bones than the



Photos in Public Domain



Doberman on the right. If they needed to be lifted, the poodle would likely be safe in an improvised vertical lift tie, whereas the Doberman would require a breed and size specific harness, or crate.

Golden Hour

Horses are designed to be upright grazing. We can determine the golden hour by considering positioning and ground surface. A horse like this, sternal in soft ground may be stable. It can drink water and eat from this position, and it is able to shift its weight, get itself up, with or without assistance.



Photo by Debra Fox

The surface that the horse is down on affects survivability

- Mud
- Sand
- Concrete
- Rock

Other conditions that affect survivability: rain, wind, heat



Photo by Felton Fire

With a horse in this lateral recumbent position, the Golden Hour activates. Protocols are to roll to the other side at least every 4 to 6 hours. Complications begin as the weight of the body crushes the down side. Compression of the blood vessels restricts the blood supply to the tissues and thus, the delivery of oxygen and glucose piles up in a “traffic jam”. Without the

oxygen and glucose, the cells can't metabolize to keep the tissue alive and the blood is not able to remove the by-products of metabolism. This leads to "Systems Failure" and atrophy of the muscles.

Crushed nerves impair conduction and function of muscles. The larger the animal, the greater the damage. Dogs, on the other hand, spend more time resting and sleeping on the ground and so can tolerate it better. Because horses are designed to be up, the inability to get up leads to depression. The horse may give up any effort to rise.

Upside down, with head downhill is a critical position for a horse and the Golden Hour is about that, one hour. During this time, blood pools in the head, sinuses, lungs and larynx. The diaphragm is crushed by the weight of the viscera, making breathing increasingly difficult. The viscera also crush the vena cava that returns blood to the heart. In short, the horse suffocates. While thrashing of the legs may help with circulation, unproductive thrashing now uses up valuable oxygen and hampers rescue efforts. Rapid extrication is essential. A dog might have much more time in this position.



Photo LAR Co.

Chapter 3 – Safety and Approach

At the end of this topic, a student, given typical physiological functions of large animals, general considerations for approaching, descriptive attitudes of animals will be able to recognize some of the attitudes that a horse, the most common large animal rescued, may express, defensive mechanisms of the horse and determine the “line of fire”, so that all elements are considered and evaluated for proper application of industry accepted standards working with and managing large animals.

Most horses will not attempt to harm a human being, but may react in defense when it perceives the human as a threat, or when startled. Defense may take the form of flight or fight.

We speak of large animals and horses in particular first, because of the concerns with explosive weight and hooves.

- Rear legs - kicking legs
 - Full extension backwards and forwards
- Front legs - striking legs
 - Can strike forward, down, **hard**

Can rear-up on hind legs and strike down

- Hooves
 - May have steel shoes, greater impact
 - Unshod hooves, may be sharp
 - Cloven hooves can be sharp
- Head
 - Horses can bite
 - Can swing with wide range of motion
 - Can raise and lower head quickly
- Stay in safety/neutral zones or out of the line of fire completely
- You can be pushed by the head, hind end, front end and be stepped on
- Stay alert, don't be distracted
- Rescuers must be attentive to animal handler, don't cause a distraction
- Horses need room to move and feel comfortable, don't confine
- Horses are claustrophobic and need a physical escape route and a mental escape route.

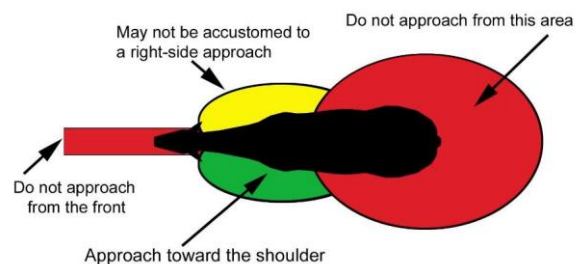


Diagram Tomas Gimenez

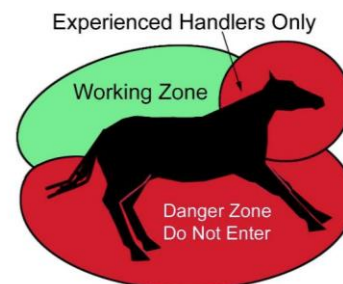
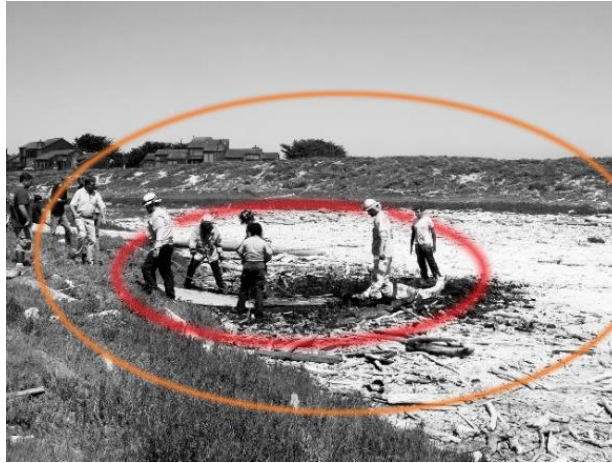


Diagram Joe Fox

View the scene from a distance to gather information, and consider the original page out i.e., horse and rider over the side, service horse down on concrete with officer, as always, what are you walking into? And what are the hazards? Situational Awareness!!



Horse Down on Beach

Is it safe to be where you are? Define your “hot” zone and determine how dynamic it is. Determine your “warm zone”. Is there a “cold zone” where you can stage the press and bystanders? Sweep each zone for hazards, sights and sounds. Movement can trigger flight or fight.

Because horses are herd animals they easily read body language and mirror that behavior. How you and others present yourselves can set the tone of the entire operations. Breathing normally is an important part of your body language and is meaningful to the horse. Clear your mind of anything negative because what goes on in your head will appear in your body language.

As with any human patient, horses are all individual personalities and cope with stressful situations in different ways. Some are stoic, some are not.



Photo Duncan Horse in Bog Compliant

Many horses realize that the rescuers are there to help, and thus are compliant.



Photo Elizabeth Fox Horse Exhausted

Others appear to be exhausted, but with a shot of adrenaline upon extrication, this horse burst to its feet and galloped off.

Compare this attitude with the next horse.



Photo Jose Carlos FAJARDO/Times

You can feel the powerful reactivity of this animal, and you can see how the head can swing like a big wrecking ball. This animal has the power and will to save itself, but its reactivity is reckless. We would like to channel that ability and make it productive. This could be done with a capable horse handler and a clear, safe path for the horse to follow.

Compare this attitude with the next horse.



Photo Felton Fire Dept.

This horse was completely immobilized and non- reactive. We were able to put the rescue strap on with no response whatsoever. Veterinarians suggest that this is perhaps a kind of “capture myopathy” where the system dumps dopamine into the brain and allows disassociation of trauma. In short, the horse is convinced that this is the end. The shutdown of reactivity doesn't mean that the reactivity is gone. With extrication, this horse burst out of the water in a fraction of a second. BEWARE of your positioning.

On approach see if the horse lifts its head up to acknowledge you. How is the horse presenting? What is the quality of breathing? By noting abnormalities or wounds, you can go into the hot zone prepared to bandage wounds, shorten impalements or take vitals. As with a human patient, you don't want to hear the kind of agonal breathing that would indicate a desperate situation. Extreme deformities could very well signal that you are not there to extricate a live horse, but you are there to assist a veterinarian with body recovery following euthanasia.

Assessment

Primary Assessment

- **Airway: open, obstructed?**
- **Breathing: type of breathing, rate**
- **Circulation: Is there a presence of blood?**

Secondary Assessment

- **Head to toe**
- **Obvious deformities**
- **Lack of movement**



Photo John Fox *Angels in the dirt*

When animals struggle to get up, they leave tracks in the ground. These tracks are like “angels in the mud, snow, dirt, sand, etc.” The tracks that correspond to each leg indicate range of motion and how static or dynamic the body is. If the body is solidly stuck in one position, the tracks will be clearly defined arcs. This clearly defines your working zones, or line of fire, until the situation changes. It also indicates condition of the legs and how well they are functioning. If the tracks are messy and scattered, then the body might be getting

more lift with efforts and with extra adrenaline the animal might be able to get up.

On approach, have a soft “face to face” with the animal. Begin a conversation that is respectful, friendly and supportive and move around the horse to a working position. When entering the “hot zone”, have an escape route that will take you away from the horse. Be sure the horse also has an escape route.

In this photo, it looks like the horse and fire fighter chose the same escape route! Notice the fearful body language of each, the arms and legs are flung out for stability, the eyes are on each other. The fire fighter is strong, but no match for this horse that could run right over the top of him. The force of the horse's back legs is a great indication of what "Horsepower" really is. Could we not put that power to work for us? Given the right conditions could we set things up so that a horse could actually save himself?



Photo Jose Carlos *Escape*

Gaining Contact with the Horse

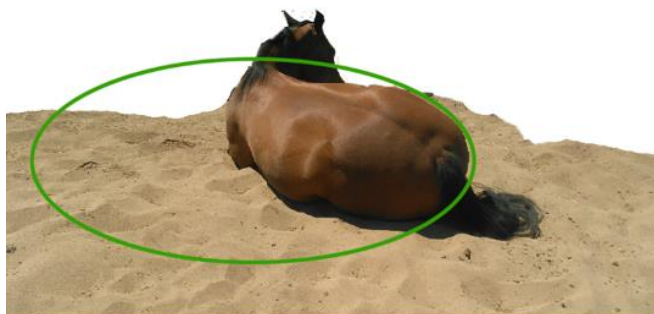
- Body language is crucial, horses are experts at reading our body language
- Be aware of the animal's flight zone
- Be sensitive to position and pressure
- Gain and maintain physical contact

When gaining contact with the animal stay on your toes. Never sit or kneel to apply equipment. If you are on your toes, and the animal pushes into you, he will help you to your feet and propel you away.

The Line of Fire can be dynamic. It is not a 2-dimensional diagram, it consumes space and can change quickly. Stay out of the Line of Fire, and have an escape route in case the animal self-extricates.



Photo by Debra Fox



Copyright Large Animal Rescue Co, 2000

Photo by Debra Fox

If the horse is recumbent, stay in a working position along the spine (dorsal side), on your toes, with a back-up person to help you get out of the way if need be. Utilize tools and techniques that will give you the reach to stay away from flailing hooves and thrashing heads. Stay in contact with the horse at all times so that it is not surprised and agitated by

intermittent contact. Your hand will be able to feel muscles bracing up, an indication that the horse is about to struggle.

Thrashing

Either work remotely with extension tools or wait until a veterinarian can sedate the horse.

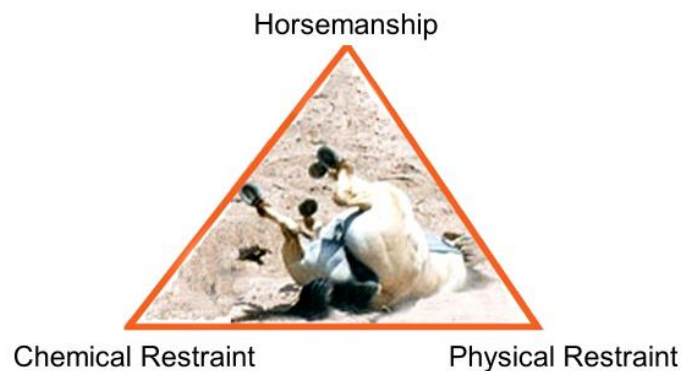
Thrashing does allow opportunities to get equipment under the body more easily if the rescuers wait for that optimal moment. As the head comes up, generally the tail and back end will mirror movement. It is essential to protect the head. As the head comes up for thrashing, throw a jacket or blanket under it, and attempt to pad out adjacent surfaces that could damage the head. (see equipment)

Thrashing may help the horse avoid some of the problems of a static position by pumping blood and stimulating the lungs.

Chapter 4 – Patient Management

At the end of this topic, a student, given management resources, methods for directing and supporting large animals, methods and techniques for passive rescue, will be able describe levels of involvement with the horse or large animal, so that approved rescue skills are applied in a consistent manner utilizing resources, and adjusting to the capability of the animal.

How do we manage a 1,000lb. patient with steel hooves and make it safely through operations? Our best resources for this are those people who deal with large animals on a day in, day out basis such as the veterinarian or the horse owner/handler. The owner may be a resource, but may be so emotionally distraught that they may hinder operations rather than help. Experience has taught that physical restraint is often counter-productive and if done ineffectively could be dangerous to the animal and the rescuer. The veterinarian has an arsenal of chemical restraints or pain killers that could make operations safer. It is important to know that horses can come out of sedation in a flash if they are stimulated by sights, sounds or feel.



The only absolute chemical control comes with anesthesia. However, when an animal is shutdown so completely, there are great risks in reviving them. Realize that when you create dead weight, it is unbelievably heavy as opposed to live weight. Herein lies the balance and art of ATR. In lieu of expert veterinary help and expert horse handling skills, rescuers can rely on working out of the line of fire, apply equipment remotely, and work with the animals' capability.

This horse was hauled out of the back of the trailer. The veterinarian chose not to sedate because the horse was compliant. The horse stood up when free of the trailer and was attentive to his handler. Here you see the "dance" that handlers strive for. Note the light support that the handler gives the horse and the attentiveness that the horse gives the handler.



Photo by Debra Fox

(Demonstration with wooden manikin) Different degrees of holding a lead line:

- A slack lead line, when used effectively, offers direction and leadership
- A “feel” in the lead line or direct contact with the horse, offers support
- Pulling the lead line tight, puts a load on the horse’s head and may get you hurt
 - If the horse flings its head, you won’t be able to hold it and you will be flung
- A pull on the lead line that brings the head around to the shoulder and tilts the jaw will get the horse to move the hind quarters over, releasing energy
- Never interfere with good movement, just support it as softly as possible

Working with horsepower, we may be able to simply create a path for the animal to follow. This horse was galloping along a hillside when he accidentally kicked out a retaining wall. As the retaining wall indicated, the ground was geologically unstable and the horse and rider were carried by landslide about 50 feet down. The rider was fine, and the horse was able to stand in the surrounding brush. 30 feet down from the horse was a ledge and below that was the remains of a massive landslide with giant redwood trees and boulders. In viewing the options for getting the horse out, up was eliminated due to the risk of additional earth movement. Down was eliminated because it led to ruin. Helicopter lift was precluded by the many electrical wires in the air space. A lateral route was chosen across the very steep hillside. To accomplish this safely, fire crews were requested and within 15 minutes were able to cut a 175ft. long trail for the horse to walk out on.



Photos by John Fox



Because horses are herd animals, and most horses want to rejoin the herd, the horse’s companion was staged at the end of the trail.

Contributions to the success of this rescue were:

1. The owner’s confidence that given a trail, this trail horse would follow it out
2. The horse’s stoicism and ability to follow the trail out in spite of an injury (rebar stab)

3. The fire crew's ability to carve a trail out of the hillside
4. Orderly scene management with remote groups working together

The trail was not a “highway”, and with full knowledge of the unstable geology, the decision was made to have the horse go out on its own without a handler. Motivated by the companion horse at the end, the horse trotted out.

At this point, it was safe to attach a lead to the horse. This picture illustrates directing and supporting a horse from a safe position. The horse has free use of the head to balance and gain momentum for the uphill climb. The handler is staying safe and will have containment at the end of the trail. Note, the handler is tethered to a backup rescuer because of slip hazard.



Photo Felton Fire Dept.



Intervention can go from passively allowing an animal to move out on its own power, to a low level of assistance. The picture on the left shows a horse that was entangled by fencing and stuck in mud. This horse was compliant and calm as rescuers removed the entanglement and freed the horse's hooves. Unsure that the horse could make

it out on its own, the rescuers used a rescue strap in a forward position to assist the horse out. The strap supports the horse at the sternum and the horse is free to use its head and neck for balance and impulsion. Note that the handler is not pulling on the horse's head, but is ready to offer support and direction as needed.

When the victim is compromised by position or location or physical impairment, rescuers may need to provide a high level of assistance and “do it for the horse”.

This horse was hauled up a slope to safety with a rescue strap. The veterinarian chose not to sedate and the horse was compliant. It was safe to haul the horse on the soft redwood duff. The veterinarian is minding the horse's head and the horse is being pulled with a rescue strap in the choker configuration around the girth. Horses will almost always lie quietly while they are being hauled, however they may try to get up when the hauling stops. The handler must be prepared.



Photo Felton Fire Dept.



Photo Felton Fire Dept.

This down horse was hauled out of a trailer with a rescue strap. This was a short extrication onto redwood duff. The horse was compliant so the veterinarian chose not to sedate. After a brief rest, the horse was able to get up and walk back to his home.

Surrounding a horse to sling him is “breaking all the rules”. Escape routes are now blocked by



Photos Felton Fire Dept.

rescuers as the sling is applied. If the horse becomes overwhelmed by the sense of being prey with predators all around, he may go into flight or fight.

Here the pressure becomes too much and the horse “escapes.” The situation becomes worse as heavy straps and buckles begin to “chase” the horse. Only a capable handler can support a horse that is in flight mode. Note how the body language of the horse and handler are similar, one of surprise.



In these situations, rescuers need to stay calm and get out of the way. The handler steps in, supports and directs the horse, and once again we see “the dance” that settles the horse down.

Patient management will go better if rescuers have the attitude that they are working with the horse instead of treating it like a big heavy object.



Does this next photo show “doing” it to the horse? Or with the horse?

Because there is a load on the lead line, the horse is not able to use its head for balance and impulsion. With its head in that position, the horses’ eyesight is limited. No wonder it is balking at going uphill. Note how the body language of both horse and officer are the same. Shut down mentally and physically, the horse is essentially in restraint and it takes several people to pull it uphill. **Safety note;** the animal is being asked to go up hill to the same spot where the rescuers and their equipment cache are located.



Copyright Large Animal Rescue Co, 2000 Photo by Jose Carlos FAJARDO/TIES 76

The same horse without a load on its head demonstrates energy and power that channeled properly, could be productive.

There are many examples of rescuers setting things up for a horse to jump out of a culvert, follow a difficult trail out of the woods, or ascend a high angle. Part of the decision-making process for helping the horse to help itself will be knowledge of the horse's capability, prior conditioning, possible injuries, and attitude.



There are times when for safety, the veterinarian will choose to deeply sedate or anesthetize, especially when lifting.



This horse was safely sedated and lifted out of a deep hole with a vertical lift tie sling. It was recovered on a narrow trail and was able to walk the rest of the way out. In this case, the need for rope systems and the many hazards in the area made patient control essential.

This horse self-extricated from a hole and once barbed wire was cut off from around its legs, was able to be led the rest of the way uphill.



Photo Felton Fire Department

Decision Making

What does the Unified Command feel comfortable with and how keen is your situational awareness? Consider safety, can you control the scene? Do you have a capable and experienced horse handler? Can you contain the animal if the handler loses control? If the horse must be immobilized, do you have the ability to work with that? What is safer for the rescuers, what is better for the horse?

Considerations for Sedation/Anesthesia

While a sedated horse may appear to be safer to work with, stimulation can cause the horse to erupt violently. Certain sedatives can cause unpredictable behavior. Because of the huge risk when using chemicals, only a veterinarian should administer any drugs. Rescue efforts need to be timed with this use. Consider the time needed for equipment application, extrication and movement to a safe recovery area.

If the horse requires full anesthesia for a helicopter lift or complex rescue, there is a risk associated with recovery. It is customary for Veterinary clinics to recover an anesthetized horse in a padded stall with one on one handling. Even so bruising, lacerations, joint damage and broken bones are all a slight possibility. The amount of control achieved in the Veterinary clinic may not be possible to achieve in the field.

Veterinary schools such as U. C. Davis continue to research better options for chemical control.

Chapter 5 – First Aid

At the end of this topic, a student, given common terminology, rescuer safety considerations, resources to assist with abnormal animal behaviors, will be able to approach and assess animal rescues, so that the administration of basic first aid needs and the application of basic first aid to large and small animals can be delivered with maximum safety while reducing additional harm to animals.

This course provides the basic information regarding animal assessment and first aid in an ATR incident. It is highly recommended that a mobile Veterinarian be requested to all ATR incidents as the medical authority.

Understanding normal health parameters of the animal species will allow for the recognition when something is abnormal. In incidents involving animals, assessment of the animal(s) health is a continuation of the “size-up” and will have an impact on golden hour, equipment applications, and tactics.

Rescuer safety is the first priority. It must be kept in mind that unlike human patients, animals have a brain stem reaction of survival that can result in dangerous and unpredictable movements. Attempts to assist animals that the rescuers are unfamiliar with may present unacceptable risks. Rescuers will need to be guided by Veterinarians or handlers that are familiar with that particular species. Direct handling should be left to the experts with first responders providing technical rescue support.

First responders may not be familiar with all species and may need to rely on the Veterinarian or animal care giver to identify abnormal behaviors. Only the owner or care giver that deals with the animal on a daily basis will know patient history and any specific changes or changes. With exotic animals, this becomes more important. Understanding normal health parameters of the species will allow for the recognition when something is abnormal.

In incidents involving animals, assessment of the animal(s) health is a continuation of “size-up”. Assessment of the animal health will continue throughout the operation as conditions may change or new conditions may be created (the animal thrashes and injures itself) or discovered (another aspect of the animal becomes visible that was not immediately visible) as the operation evolves.



Photo David Byerly, DVM

Take an initial overall view of the animal's condition and demeanor and then start to consider individual aspects to better understand the severity of any injuries that might exist. Whenever possible, collect this information through observation and leave hands-on assessment to experienced individuals.

Posture – Is the animal able to stand or is it laying down? If the animal is standing are all legs fully utilized or does it seem to be shifting weight or not weighting a leg at all. Is it leaning backwards to remove weight from the front or vice versa?

Vocalization – Is the animal making any sounds? Groaning indicates pain, severe injuries, or discomfort. Calling out can indicate the animal is stressed and looking for others. Nicker or low volume calls can indicate a social greeting and an animal that is not in significant distress. Severely injured animals tend to make as little sound as possible unless it is to vocalize pain.

Range of motion of limbs – An animal that self-limits how it uses its limbs, may have soft tissue or bone involvement. However, horses in particular often have lame gaits before injury that the owner may be able to identify as normal for that animal. An animal that stays extremely still and, if laying down, does not attempt to stand up may have significant injury. Animals tend to avoid laying down in vulnerable situations.

Respiratory Rate / Heart rate –Shallow or slow breathing can indicate shock. Other signs of respiratory problems to be aware of are noisy breathing; difficulty breathing in or out; deep, forceful breathing; or coughing, especially a dry cough or one that brings up mucus or blood. Normal RR in horses is 12-15 breaths per minute. For Dogs, normal RR can range from 10-35 with 24 being typical.

Rapid HR can indicate pain or stress and slow heart rate can indicate shock or impending death. Normal HR in horses is 30-40 beats per minute (half a human's normal range) – if HR reaches 50bpm that is the start of pain indication and if it exceeds 80bpm there is extreme injury. Less than 20 indicates shock or impending death. For Dogs, normal HR is 60-100 in large dogs and 100-140 in small dogs and is taken on the inside top of a hind leg (the femoral artery).

Condition of skin/hair – Horses in extreme pain often profusely sweat and horses that are injured or trapped can struggle to the point of exhaustion which also can cause profuse sweat.

Taking into consideration the overall condition of the horse's skin/hair and hooves this will give context to its current condition. Poor hair coat quality (brittle/rough) can indicate poor condition prior to incident. Conversely fur that has some shine and is smooth and soft usually indicates that the animal was healthy at the time of incident. Horse hooves that are healthy are smooth and consistent in texture.

Bleeding or discharge from eyes, mouth, nose, skin – The same principles of bleeding in regular first aid still apply to animals. If bleeding from mouth or nose it could indicate direct trauma to those areas or internal bleeding. Eyes on a horse are extremely vulnerable due to their size, so measures should be taken to protect the eyes from injury. A blanket, jacket, or dog bed can be placed under the animal's head. Animals with profuse bleeding should have pressure applied when possible to stop bleeding, keeping in mind that large animals, like a horse, can lose over a gallon of blood without significant concern.

Signs of fracture such as unnatural angles or abnormal bumps are extremely important when considering whether and how to manipulate an animal. In horses and other livestock fractures are often not able to be treated successfully and a veterinarian should be consulted before attempting to perform any operation. Livestock with a suspected fracture that are laying down should not be forced or asked to rise without veterinary consultation. If a limb is not visible consider if it could be under the animal out of sight. Try to assess angle and position of all limbs before manipulation.

Extreme swelling of limb can also indicate fracture or soft tissue trauma that is significant and veterinarian consultation becomes imperative.

Lack of limb or animal motion – Particularly in livestock an animal that does not attempt to respond or move upon approach may be in shock or extremely injured. If an animal is attempting to move but clearly has parts of its body unresponsive and paralysis is suspected, then veterinarian consult becomes imperative.

All these parameters can be observed from a safe distance. Gathering information from a distance may allow the responder to accurately assess the basic health of the animal(s) without approaching, stimulating or stressing the animal(s).

All these parameters can be observed from a safe distance.

What is the horse's position?

Can you see all limbs? Bleeding?

Example: The horse in this picture had tumbled down a ravine, and landed in a gully. The legs are not visible but were positioned to the right of the body. The extreme position of the



Photo Felton Fire

head/neck was causing agonal breathing. Though rescuers were able to lift the body, thus freeing the head, the horse immediately expired due to a blood clot or broken neck.

Conducting a hands-on exam requires the rescuers to place themselves in a dangerous situation not only with large animal but small animals.

Care needs to be taken when handling any animal showing signs of an altered mental state due to unpredictability of the patient and due to zoonotic disease with possible rabies exposure. Although few diseases cross the species boundary to humans there are some like Rabies that should be considered in rescue operations.

Instructor can demonstrate each restraint mechanism if available.

For Gauze roll method, be sure to check for restriction of airway and note that some dogs do not have muzzle types (such as pugs, bull dogs, etc.) that cannot be effectively muzzled using these methods.



Photo Tim Perciful

Sometimes it is easier to place carrier on end with opening on top to place felines inside.

Wrapping a towel around all legs leaves only teeth as possible danger. Placing body into pillow cases is also effective restraint for legs while leaving head exposed but keep in mind that in the process of placing in the pillow case can be difficult.

Felines have infectious properties in scratches and bites that can become serious so sterilization of any wounds is important and puncture wounds are common risks.

Flight animals that are trapped may panic and restraint can cause them a similar level of stress. In fact, restraint, can be counter-productive for safety.

Feed can be used to lure a horse or cow(s) to a contained area where they can calm down and this strategy tends to be safer and more effective than driving or chasing the animals.

If the training history of the animal is unknown, haltering for control may not be possible. Observe how the animal responds. Many horses, may avoid being haltered but once the halter is applied may be quite easy to handle and others may have never been haltered and would panic if attempted. If the animal is difficult to halter but haltering is determined to be a need then an experienced handler should assist.

Tranquilizer darts are not very effective on equines and if it is utilized the horse would need to be left at rest for the drug to take over. Tranquilizer darts on equines that are in motion rarely work.

Swine, sheep, goats, poultry: Direct restraint for most of these animals may be counterproductive and/or may be unachievable due the level of handling and restraint most are accustom to. Utilization of more specialized containment is indicated and necessary. Most typical large animal restraints may not be effective on this livestock. Panels may be too open allowing the animal to squeeze between the bars.

Heart Rate, Lung sounds, Capillary refill time, Palpation of limbs If safe to do so, this information is very helpful for the responding vet. The veterinarian will determine the significance of exam findings. All findings obtained from a distance and hands on needs to be transmitted to the in-route vet. This becomes very important if the incident is remote allowing the vet to be prepared and bring the required medications and supplies. If the incident requires a hike in, consider having help available to assist the vet in hauling the needed equipment.

Heart and Respiration rates are important, however attaining this information may not be practical, safe or necessary. Look for the heart sounds behind the left elbow. The heart rate averages 30 – 40 beats per minute. A HR above 60 is an indication of pain or stress. Respirations should be in the range of 8 – 16 breaths per minute and can be seen best at the flank. As with a human the quality of the respirations should be noted.



Photo John Maretti

Injured animals can thrash or struggle and cause safety issues for responder so where a safe approach zone cannot be established or where the animal is actively changing positions or stressed it is better to wait for medical assistance. Often minor abrasion and lacerations may not require any direct intervention. While wounds may appear unsettling, direct management of the wound is often counter-productive for the rescuer and the animal.

Wounds involving significant blood loss: apply direct pressure with non-stick padding, amount of padding is relative to the animal. Only perform if safe to do so. All bandages applied to a limb or animal should be evaluated a quickly as possible. A tourniquet should not be utilized without the direct supervision of a veterinarian, as inappropriate/excessive pressure can lead to additional trauma and loss of the limb/animal. NOTE: blood loss may not only be external. Volumes in large animals may call for full size towels as compression bandages.

Example: An 11lb. dog has about 12 ounces of total blood volume, a 10% loss, or about 1 oz., can occur without significant concern, but it carries a risk of hypovolemic shock. If it loses 25% of this volume its chance of survival is about 50:50, so blood loss over 3 ounces is significantly life threatening. In contrast an average 1,100lbs horse has about 13.2 gallons of total blood volume. A normal healthy horse can lose 10% or about 1.3 gallons of blood without significant concern, if it loses 25% of its volume, 3.3 gallons, its chance of survival is 50:50. The loss of 40% blood volume is not compatible with life, which is the equivalent of 5.2 gallons.

Small Animal Bleeding Digital pressure to the supplying artery can be attempted if the animal can be controlled and if no other injuries are noted (fractures). If the wound is on a limb, elevate if possible.

All bandages applied to a limb or animal should be evaluated as quickly as possible, however elevation of the wound may only be possible if the animal is cooperative.

The bleeding has stopped in this picture of a horse that was stabbed by rebar. The veterinarian will x-ray to help determine extent of injuries.



Photo John Fox



Photo John Fox

This horse had major vein that was cut. The veterinarian was able to clamp and stitch the vein.

Penetrating Foreign Body

- If possible leave the object in place.
- If necessary, cut the object close to the body.
- Attempts to stabilize could result in more stress and tissue damage.
- Waiting for veterinarian should be seriously considered.
 - Foreign body injuries should be managed to minimize secondary traumas and prevent additional blood loss if the foreign body shifts or is removed.
 - If possible leave the foreign body in place.
 - If necessary cut the object off close to the body.
- Attempts to stabilize the object could result in more stress and damage to tissues.
 - Photographic Images should be considered part of the assessment to aid the veterinary responder in understanding the nature of the trauma/incident.
 - Photo documentation will assist in treatment and will document the damage presented.

This horse was hit by a car and had the car's antenna through it's the leg. Firefighters on scene were able to clip the ends of the antenna pending arrival of the vet.

Car Antenna



Chapter 6 – Scene Management

At the end of this topic, a student, given scene management principles, coordinating with impacted and assisting organizations, rescue concepts, will be able to manage organizational systems and resources, so that operational considerations for ATR incidents within the context of disaster or single incident response will coordinate with allied resources to mitigate and reduce the implications of an ATR incident.

East Sussex Fire Brigade in the United Kingdom acknowledges that it is difficult to establish set procedures for animal rescues because they are dynamic.

East Sussex Fire Brigade Operations Manual Part 1 - Section 7 Animal Rescues 7.3

- “Procedures cannot be written for all incidents due to the unpredictability of the situation.
- Personnel should be adaptable to improvisation, but equally be aware of the capabilities and limitations of the H4P (equipment).
- Personnel should also be aware of their own limitations...”

Animal Rescue, especially LAR tests the limits of knowledge, experience, equipment and emotions.

Access Your ATR incident may happen in an easily accessible area, it may happen 2 miles down a deer trail under thick tree canopy, or in the midst of a heavily trafficked downtown street or highway. The act of **getting equipment and rescuers to the site may be your biggest challenge.**

Equipment Especially with horses and cows and the heavy loads that they represent, equipment must be rated adequately. Equipment that is rated for level ground does not always seem to have the same capability in a high angle/heavy load situation.

Personal Limitations and experience Lack of experience and training can make a response more stressful. When emotions run high on scene, they can have a high impact on the emotional state of the **animal. When emotions lose control, operations can fail.**

Though it is difficult to write procedures for LAR/ATR rescues, pre- planning, training, and MOUs (Memos of Understanding) with AHJ (Authorities Having Jurisdiction) will create a common understanding and help responders to work in concert with each other.

Useful Information

- What is the nature of the incident?
- Is there a rider? With injuries?
- How many horses are involved? injuries?
- Is the owner present and capable of making decisions concerning the welfare of the animal?
- Has a veterinarian been notified?
- Notify animal control and law enforcement if necessary

Some of this information will be covered with your tone out. You may be able to access further information via phone. Any additional will help determine common goals, strategy and tactics, and needed resources.

Cost There will be a cost associated with certain resources like a veterinarian or heavy equipment or helicopter. Be sure that you have provided for these concerns with your inter-agency agreements and make sure the animal owner understands the responsibility of payment. Efforts to address these issues early in scene management will ensure a smooth “hand-off” upon extrication of the animal patient.

The idea of “**Unified Command**” was introduced in the ATR Awareness Level and comprises AHJs and important resources for ATR. A classic Unified Command may consist of:

Animal Care & Control as the legal authority, animal expert, and patient advocate, can provide transport and sometimes shelter in lieu of the owner. If the incident is due to negligence or abuse, AC has the ability to cite the owner for a violation.

The Fire Department is a resource for technical skills, multi-agency command, equipment, radios, rope systems, staffing and the ability to request additional staffing. ATR fits nicely into the skill set for USAR and many USAR teams have added this technical specialty.

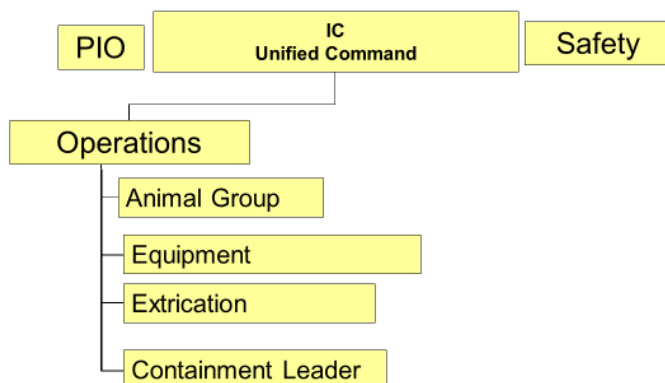
Law Enforcement may have jurisdiction over trailer wrecks on the roadways, or in off-road areas including city or county, parks. A resource for skills, traffic control, crowd control, may be first on scene.

The Veterinarian is the medical authority and may be familiar with the animal and its patient history as well as its capability. The veterinarian has the IV solutions and medication for rehab, pain, infection. The veterinarian is also experienced with handling stressed animals. He or she can monitor the condition of the animal and recommend tactics or changes in tactics. The veterinarian must work closely with operations to time sedation or tranquilization that might aid extrication efforts. The veterinarian can administer euthanasia if necessary.

The Animal Owner is a vital resource for knowledge about the animal, what it is capable of, what it is fearful of and its conditioning. If the owner can maintain emotional control he or she is your best resource for patient management. But if the situation is too emotionally overwhelming, the owner may need to be separated from the animal. If the owner is not calm, the animal will not be calm. **The owner is paying the bill and must be consulted before requesting costly resources.**

Depending on the state or county, different agencies may take the lead on ATR response or be a resource. Other players could include VERT (Veterinary Emergency Response) teams, Search and Rescue, Mounted police, Livestock officials, Brand Inspectors, or non- government

organizations (NGO)s. What makes the most sense for your community?



Operations

Simple extrications might be resolved by one good cowboy. But a more complex incident may require a full response. A Matrix for ATR would include these groups, but could be expanded to include human medical groups, helicopter, etc.

When this is the case, “Operations” will need to co-ordinate the groups and operations on scene. Consider the big and often unpredictable movement of a large animal and accommodate with an adequate working space. Think about the area needed to land a helicopter, or the size of a round pen for training horses. If possible, 60’ diameter is a good space to allocate. Plan out safety zones for the rescuers, direct any rope systems and haul teams away from the animal, and consider likely escape routes for the rescuers, handler and the horse itself.

- Coordinate all rescue operations and groups on-scene
- Considers the unpredictable movements of the animal
- Establishes safety areas

- Determines the need for and requests additional resources

The **Animal Group/Handler** will interface with the owner to obtain a patient history, pertinent knowledge about the rescue, and capability of the animal. They will work with the veterinarian. In lieu of a veterinarian, the handler will provide support throughout operations and will communicate if the patient is becoming difficult to handle.

The Equipment Group Anyone working in close proximity to an animal should be tethered for quick removal. This group or individual will work with the animal handler/vet to apply equipment. The number of rescuers in the “Hot” zone must be limited to only those necessary for the task. Plan equipment applications prior to entry into the hot zone so that strapping or slinging can be done efficiently and effectively. Rescuers must stay out of the Line of Fire and stay on their toes. Rescuers must be agile and not compromised in any physical way for this critical task. *If multiple equipment applications must be accomplished, carry these out as single tasks, one before the other. Carrying out tasks concurrently may put too much pressure on the animal and force it into fight or flight.*

The Extrication/Haul Team Leader is responsible for the extrication of the animal and the set-up of haul teams and haul systems. Occasionally terrain will dictate that the haul team will be remote and out line of sight with the animal group. The haul team leader will determine communications (hand or voice or radio) as well as haul technique. In the case of a long haul utilizing rope systems, the haul team leader will haul the animal to a safe area where the animal can be “sheltered in place” while the system is reset. Animals tend to lie quietly while being hauled but will thrash and attempt to rise when the movement stops. The haul team leader and team must be vigilant and ready to stop at any moment.

The Containment Officer needs to be familiar with the species being contained. This position may range from holding a loose horse while its companion is rescued, or providing containment for multiple animals that are on the roadway. The containment officer will identify areas where the animals can be contained until they can be transported elsewhere. He or she will organize personnel and equipment to lure, herd, or possibly capture and contain the loose animals. The officer will maintain control of the **animal until they are handed off to a responsible party.**

The Safety Officer is responsible for the safety of all rescue personnel. With oversight of all operations, he or she will monitor proper and safe use of rescue equipment, use of appropriate PPE, work with operations to define safety zones and will prompt safety practices. The safety officer must not be deterred for other tasks that could take attention away from safety. Individual rescuers must also take an active role in safety, being responsible for themselves and their actions and watch out for the well-being of their fellow rescuers.

The Public Information Officer is important for ATR/LAR incidents because of the novelty and interest in these events. The PIO will be the contact person for all news media, will monitor the progress of operations. The PIO should have sufficient understanding of ATR/LAR operations to articulate risk, constraints, and condition of the animal patient. After extrication, the PIO should be able to describe reasons for success or give concrete reasons for challenges that may have led to failure.

“A HAZMAT on Legs” Cpt. Dave Lopez, Orange County Fire Dept.

ATR incidents have been compared to a “HAZ Mat on legs”. Unless the veterinarian has absolute control over the animal, your incident could be dynamic. Your “hot zone” or everything near the animal could move instantly if the animal self-extricates or staggers. Rescuers should be out of the hot zone as soon as they are finished with any assignments. The “warm zone” is safer for the rescuer to stage in, but they must realize that a sudden sight or sound can impact the animal and cause it to react into the warm zone. The media and public onlookers must be confined to the “cold zones” where the animal will not be impacted by their sounds or actions.

- Establish zones, determine span
- Who will be in each zone?
- Who will be moving between zones
- “Sweep” each zone for hazards, obstacles
- Adjust zones as necessary

On-Scene

Rescuers should never under estimate the impact of their arrival on scene. Unfamiliar sights and sounds could trigger reactivity of the trapped animal and subject it to further trauma or entanglement. If the animal is in a precarious position, it should be protected from unusual sights and sounds until adequate chemical restraint can be delivered by the veterinarian. In one rescue example, a horse was impaled by a metal T post. The sound of the diesel fire engine arriving on scene caused the animal to struggle and eviscerate. Your approach should be quiet without lights or sirens, and with the sound of pagers and radios turned down. You may be directed to park your vehicle in a way that will help provide a barrier for the incident or containment for the animal. Once out of the vehicle (s), a low level of “white noise” should be established and movements should be calm and deliberate, no throwing or dropping of equipment.

- Quiet approach, don't rush in
- Scene size-up
- Attend to human injuries first
- Low light levels
- Establish an ICP
- Set common goals
- IC or Operations designates team leaders

Size up starts at dispatch. Requesting additional resources ASAP is important. Most dispatchers will need to be prompted to request a veterinarian, or other resources.

Hand Off must be considered early in Scene Management, especially if the owner is not able to assume care and control of the patient. In the event of a trailer accident or trail accident, the owner may suffer injuries and be transported to a local hospital. The IC/Vet must provide for a hand off that will give the animal adequate after care and treatment if needed, and safe transport and housing. As described above, responsibility for associated costs must be assumed by the owner or AHJ.

- Once an animal is rescued, it needs to be handed off to a responsible individual or agency
- Depending on the species, this will vary considerably
- Generally, Animal Control is the AHJ, and will be the responsible
- Animal Control should have MOU's in place

In general, this falls to Animal Control, however, any agency or group that responds needs to have these MOU's in place to avoid being billed for services. If you request it, you pay for it unless these are in place.

Equipment Cache



The equipment cache should be kept by an agency or organization that can make it available 24/7

Who has the equipment? Have they been responded?

Rescue concepts

- Consider **mechanism** of incident
- Consider potential for **secondary disaster**
- **Stabilize** the situation
- Alter position of the animal to **buy more time**
- Standing horse, you have more time
- Remove the patient from the object or the object from the patient
- Exert pressure on the stationary object, not the patient
- Consider all routes out
 - There might be other options besides up
- **What is the horse capable of doing?**
- Estimate the current “Golden Hour”



Photo John Fox Alter Position to buy More Time



Photo Felton Fire Remove Stationary Object



What is the Golden Hour for this horse?

Operational Review

- Unified command sets objectives
- Remember concepts
- Operations determines tactics
- Establish communications
- Carry-out operation
- Continue size-up and adapt
- Consider legal aspects if euthanasia is imminent given mechanism, prognosis and difficulty of rescue

The owner has the authority to resolve the animal's fate, this can be assumed by Animal control if the owner is not present. Depending on local laws, law enforcement may share authority. It is vital to involve the veterinarian in determination of euthanasia and the implementation of euthanasia. Some animals are insured and a reasonable, documentable attempt must be made to contact the insurance company. The Veterinarian should be able to facilitate.

Safety of the rescuers is a priority. Safety is everyone's responsibility.

- May not be possible to manage risk at a reasonable level
 - If the rescue is too dangerous, decline the assignment
- "Capture drugs" may be an option

- Euthanasia may be the only option



Video Kev Escott Two Horses fallen through bridge

This example of two horses that had fallen halfway through a bridge, highlights how susceptible horses can be to emotion on scene. The horses remained calm until the owner panicked, at which time the horses made a hasty exit by scrambling over the side. This could be anyone on scene that can't control their feelings and behavior. Emotions carry sufficient impact to cause a rescue attempt to fail. All responders must remain calm, work thoughtfully and with a purpose.

Chapter 7 – Physics

At the end of this topic, a student, given physical properties of ATR, safety considerations, terminology of ATR rescue aspects, will be to explain how physics theories can measure and deliver many components of ATR considerations, so that consistent and calculated techniques and protocols are managed on incidents

Physics principals come into play with almost all aspects of technical rescue, especially with large animals. Understanding force, the distribution of forces, friction, the center of gravity and vectoring will make LAR easier and in some cases, will make it possible.

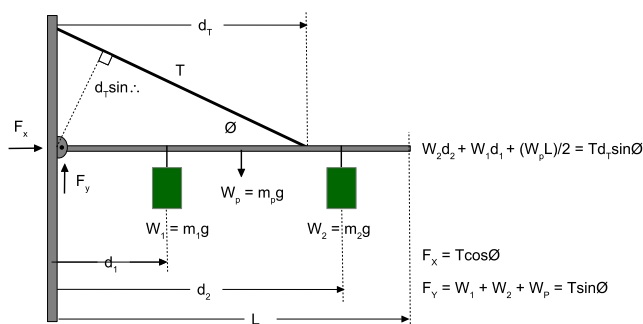


In this photo, the cowboys are redistributing forces to gain better control of movement (adding vectors).

Photo Scott Baxter

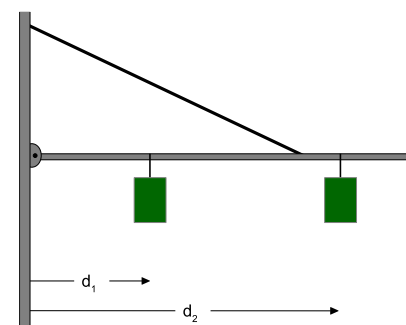
Actionable Knowledge

While physics uses mathematics to verify the science and to calculate the specific forces, this lesson will focus on actionable knowledge that can be applied in the field. This will help you to employ rules of thumb within safe limits without having to perform calculations.



Images Brad Silen Mathematical proof

This



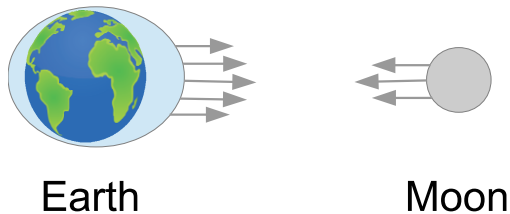
Simplified to Rule of Thumb

example of two loads proves mathematically that the outboard block puts greater force on the wire holding the horizontal arm.

By developing “rule of thumb”, we can focus on the principals and how they apply to safety, allowing you to operate within safe limits and not have to perform any calculations.

Force of Gravity

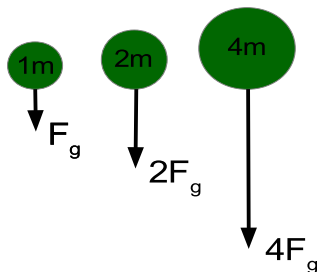
Gravity is the term we use to describe how nature causes all objects with mass to be attracted to each other.



Weight

On earth, we experience gravitational attraction as weight. Weight is the pull of the mass or “stuff” of an object towards the mass of the earth.

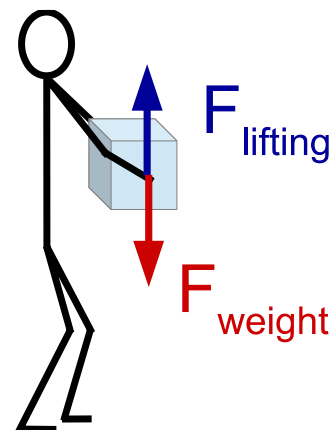
Weight is a type of “Force” and is always directed toward the center of the earth.



‘F’ is the letter used to indicate Force. ‘F’ sub ‘g’, written as ‘ F_g ’ is the Force of Gravity. ‘ $5F_g$ ’ is five times the force of gravity.

Another example of force is a lifting force shown in this diagram as the blue arrow “F lifting”. Notice, if the object is not moving, the lifting force “F lifting” will be equal to the force of gravity “F weight” – which we call the “Weight”. When forces are balanced, we say a system is in equilibrium.

Note that our stick figure has been careful to bend his stick knees to protect his stick back!

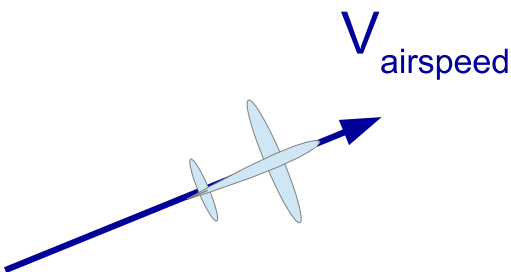


Scalars vs. Vector

Scalars are only a single number – a value. Examples include: temperature and age. Vectors have a value and a direction. Examples include velocity and force. A vector is usually drawn as a line with an arrow showing the direction.

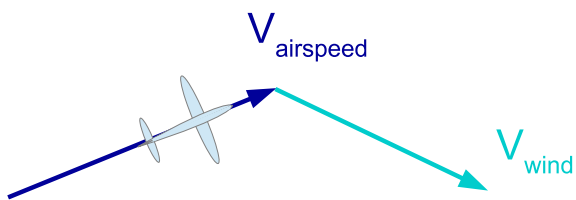


Vectors have a value and a direction. Examples include velocity and force. A vector is usually drawn as a line with an arrow showing the direction.

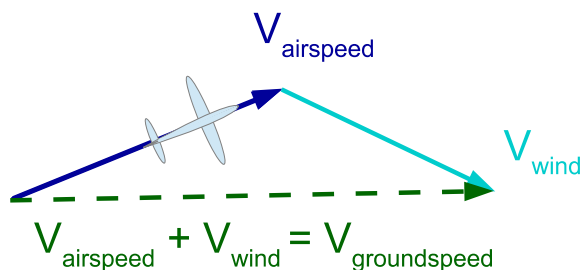


Vectors can be Added

This figure includes the vector of the plane's airspeed velocity added to the direction and magnitude of the wind – the wind velocity vector.



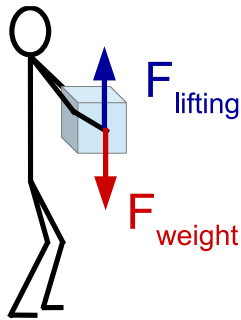
This figure includes the vector of the plane's airspeed velocity added to the direction and magnitude of the wind – the wind velocity vector



When the vectors are placed head to tail, the result is the ground speed vector of the airplane.

Vectors can be Subtracted

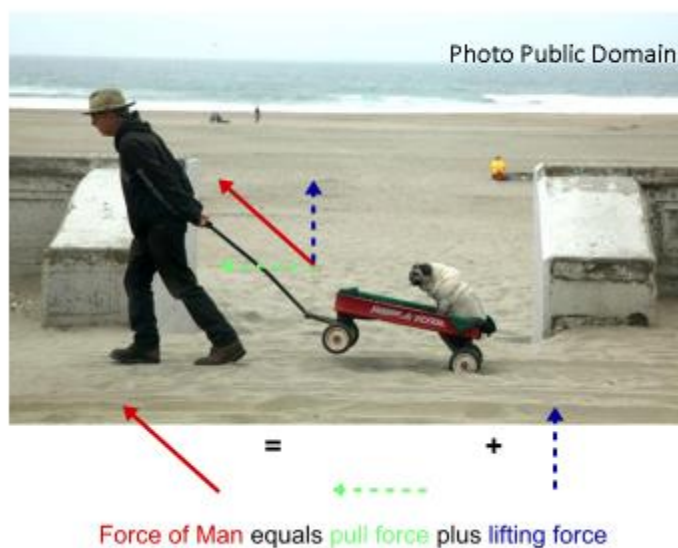
Vectors can also be subtractive. The force F of lifting is counteracting the force of the weight to produce a resultant force of zero and the box is held in place and not moving. You might experience this when hauling a large animal! If the animal is not moving at the beginning of the haul you need more people on the haul team. **If a haul in progress stops, look for a force in the system like an obstacle that needs to be cleared.**



$$F_{\text{weight}} - F_{\text{lifting}} = 0$$

Breaking Vectors into Components

Vectors can be broken into component parts. In this example, we can see how the force of the man pulling on the wagon has both a side pulling force component (green horizontal dashed line) and a lifting force component (blue vertical dashed line). The dashed lines highlight components.



Distributing forces on large animals

Different materials are said to have a “coefficient of friction” between them. A **Slip Sheet** under block A will lower the friction (bar under A).



Lift to Reduce Friction

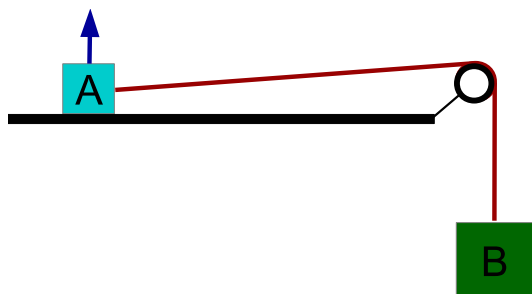


Photo Lacey Duncan Lifting to reduce friction

Lifting block A decreases friction.

Putting it all together

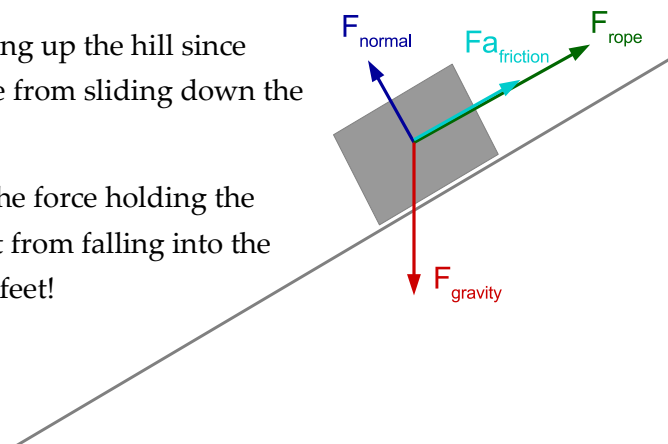
Imagine the block is a horse on a hill. You now have an understanding of all these forces.

F_g is the force of gravity pointing to the center of the earth.

F_a is the force of friction which is pointing up the hill since friction is contributing to keep the horse from sliding down the hill.

F_n is called the Normal Force and it is the force holding the horse against the ground and keeping it from falling into the earth. This is the force you feel on your feet!

F_f is the force of the rope system.



Possible Improvement?

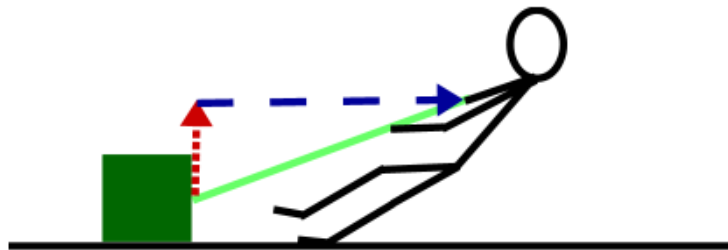
In the following rescue, it would have been easier to lower this animal to the bottom of the hill, but in this instance, that was not possible and the horse had to be hauled up the hill.



Photo Felton Fire Department

When you are planning don't immediately rig the first scenario that comes to your mind, but quickly test all the other cardinal directions to make sure there is not another option.

Reduce Friction When Possible

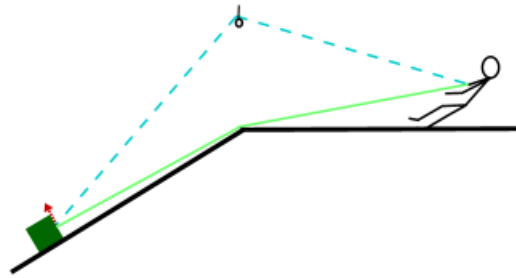


When pulling a horse along the ground the responders' height is advantageous by creating the lifting force (red dashed vector).

The lifting force reduces friction which may require less force to drag and will be easier on the animal.

Angles Matter

The green rope system below is very typical with the crest of the hill establishing the rope angle. This rope system requires a great deal of force because the animal is being lifted up the hill, there is no upward force to reduce the friction, and there can be an increased normal force (force into the hill) causing even greater friction. If the opportunity presents, one can employ a pulley, shown here on the turquoise rope system, to introduce a lifting force to lesson friction.



- Green (solid) rope system typical.
- Turquoise (dashed) rope system adds a lifting force (red dotted vector) to reduce friction.
- Best to use a slip sheet under the animal when possible.

Distribute the Force

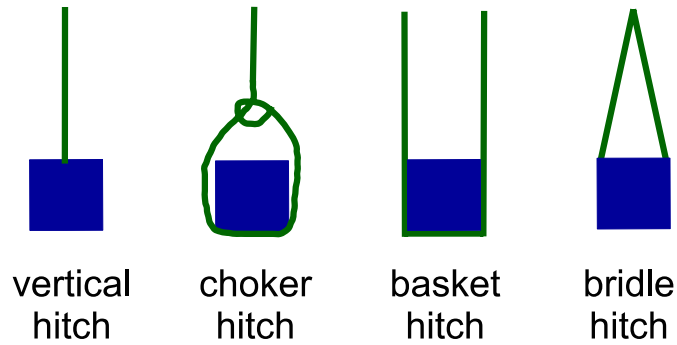
On one extreme we have a cheese cutter which causes the force to be applied to a very small region and therefore is great enough to cut.



On the other hand, we have the seat of a child's swing that applies the weight of the child over their entire seat.



Selecting a Hitch



Vertical Hitch: animals don't have a lifting eyes, and, their weight distribution makes it difficult to balance their body for lifting

Choker Hitch: Very secure and difficult for animals to come out of, but can potentially harm the subject with the choking force. Must be applied to the girth where skeletal structure is substantial, where the strap takes advantage of the center of gravity, and where the outboard front legs help to maintain placement. This choker has worked well for quick extrication, especially where there is a chance for secondary disaster.

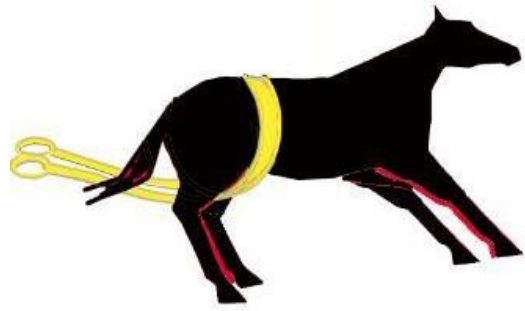
Basket Hitch: Excellent on the ground because it does not choke the animal and gives the responders control over direction and rotation. The dynamic load of the animal can make it difficult to balance for lifting and the animal can flex out of it.

Bridle Hitch: This would be a very stable hitch if the animal had lifting eyes on each side. The two-strap lifting sling is a similar application but for a live load must be supplemented with a chest strap and a butt strap. Rescuers must arrange the pick point carefully to balance the load at the center of gravity.

Distributing Forces on Large Animals

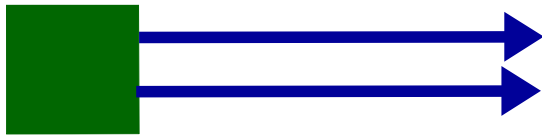
Select the type of hitch, and the placement of the hitch based on your knowledge of the animal's anatomy, to minimize the risk of injury. The hitch, or strap, must be 4" for an average 1,000lbs animal to avoid the "cheese cutter" effect. When hauling from the front use a choker.





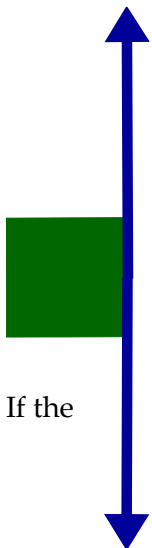
When hauling from the rear, avoid choke force around soft tissue and use a basket. The hips will help stabilize the rescue strap placement.

Multiple Ropes



Clearly if you have two people pulling in the same direction, as you would expect, you will get twice as much force.

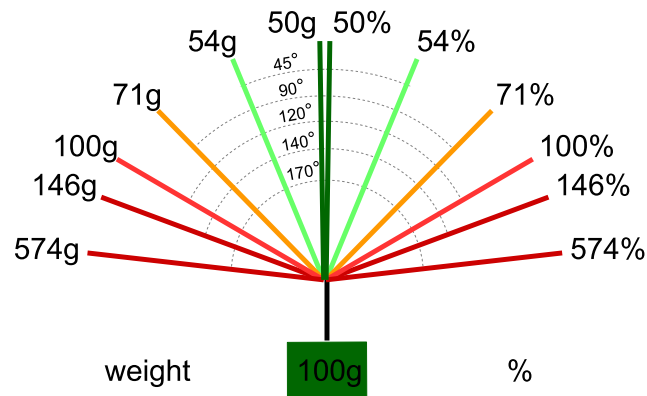
Multiple Ropes or Lead Lines



In the extreme case if the two people are pulling in opposite directions, against each other, they can add a huge amount of force (to each other) and not to the object (the horse).

If the horse pulls back or runs forward, its movement adds a vector that can force the handlers off their feet. It is safer to have one handler from not only the horse behavior aspect of linear hierarchy, but also from a physics point of view.

Multiple Ropes



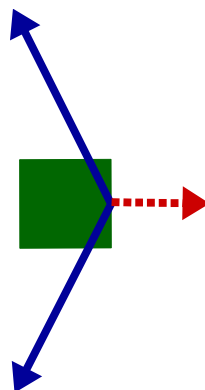
The amount of force put on each rope increases dramatically as the angle increases. **Keep angles to 90 degrees or less.** In other words, with two anchors placed directly in-line with the load, they share the load, the farther apart they are dramatically increases the load on each anchor.

Locating Anchors (purchase points)



Anchors should be connected to distinct purchase points. Keep the angles between the ropes as small as possible. For example, use trees which are along the same line as illustrated above. The connecting ropes are tied further down the rope to further decrease the angles.

Multiple Ropes



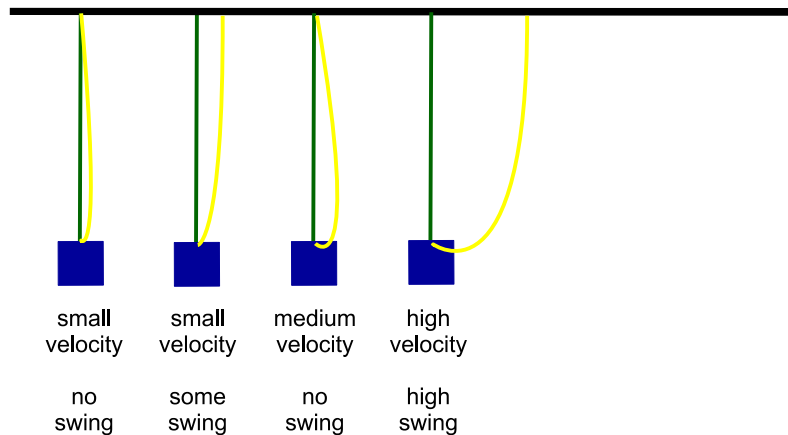
Not only will the horse not be affected but the horse will have tremendous mechanical advantage over the handlers!

Shock Loading

The force of a falling object is based on the mass of the object (limited control), how fast it is able to accelerate, and how much time it has to slow down.

The longer an object has to fall the faster it will be traveling before it is arrested. Therefore, always take up the slack in your rope systems!

You may be able to use swing to your advantage.



The first rope system is a blue weight hanging by a green rope with a yellow rope as a safety. If the green rope were to break, these systems will have different amounts of shock loading on the yellow rope.

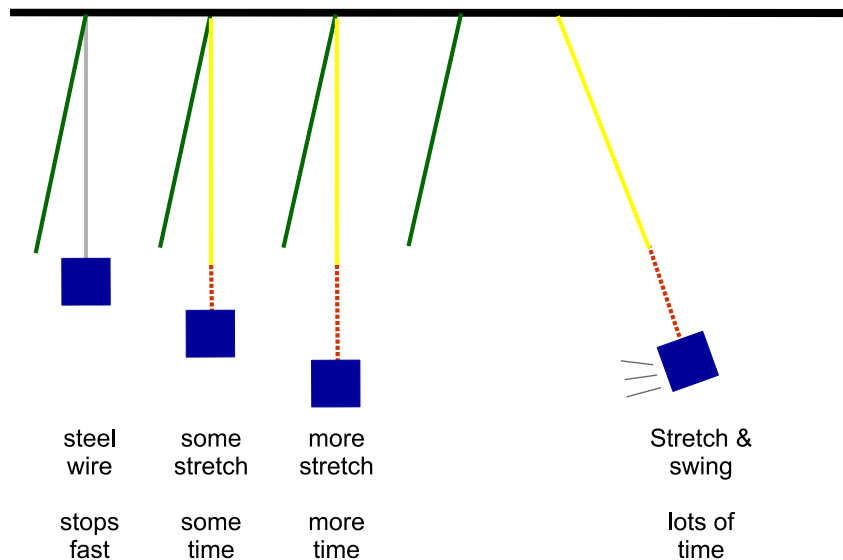
The first rope system has a short safety rope so the weight will not be able to accelerate to a very high velocity and when the safety line is engaged it is above the weight so the load will not swing.

The second rope system has a short safety rope, the weight will not be able to accelerate to a very high velocity, and when the safety line is engaged it is not above the weight so it will not swing. The swing could be very dangerous if it were to force a horse to swing into a responder. However, the swing would dissipate some of the energy and can be used strategically to reduce the shock loading.

The third rope system has a not very taught safety rope, the weight will be able to accelerate to a reasonable velocity, and when the safety line is engaged it is above the weight so it will not swing.

The fourth rope system has a lot of slack on the safety rope, the weight will be able to accelerate to a high velocity, and when the safety line is engaged it will cause the weight to swing substantially.

Use Stretch and Swing



Rescue rope is typically “static” with less than 7% stretch. Rock climbers use “dynamic” ropes which stretch to give fall protection.

The first rope system uses a metal wire which will not stretch, the weight will stop very quickly, and it will have the highest shock load of these examples.

The second rope system uses a rope with some stretch, it will take a movement of the rope to stretch, and the force will be spread over that time.

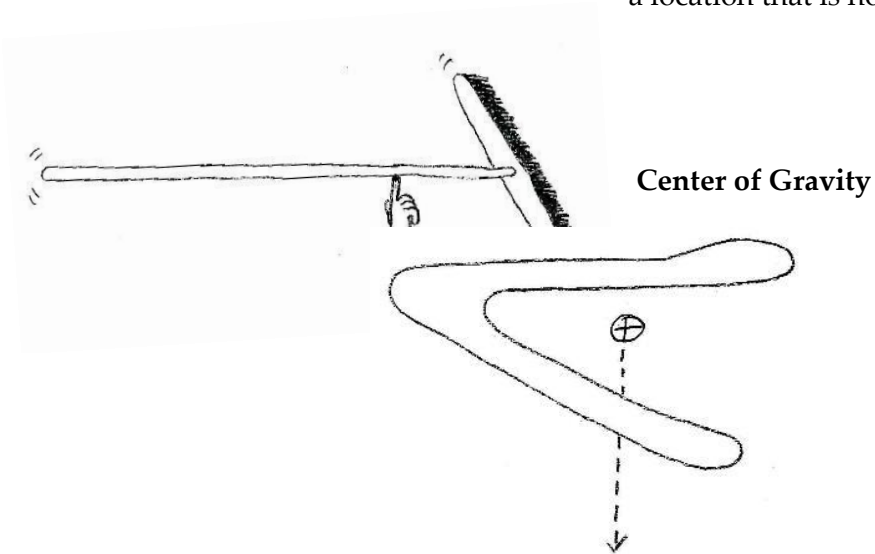
The third rope system uses a very stretchy rope, it will take even more time to slow the weight, and have even less shock loading.

The fourth rope system has both a stretchy rope and the safety rope will force the weight to swing. In combination, this system has the least amount of shock load of these examples but the swing must be handled in a safe manner.

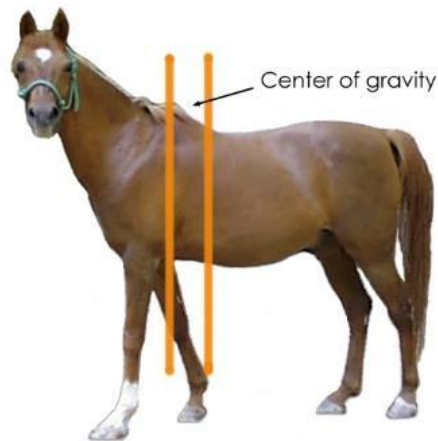
Center of Gravity

The center of gravity is not necessarily the center of the object. It is the balancing point of an object and the place you want to lift to keep the object balanced. Note that the object will have

equal amounts of mass on either side of the center of gravity. In ATR, we are usually pulling at a location that is not the center of the animal



Interestingly the center of gravity may not be on the object itself like the case of a boomerang. But, fortunately, you won't have to rescue any boomerangs.



The center of gravity for a horse, and most quadrupeds, is just behind the withers which is the ridge between the shoulder blades.

Select a pick point above the center of gravity.

Some examples of horse types and weights



Mini 198 lbs.

Shetland 298 lbs.

Welsh 600 lbs.

Arab 950 lbs.

Quarter 1,100

Thoroughbred 1,000 lbs.

Warmblood 1,700 lbs.

Shire up to 2,700 lbs.

Chapter 8 – Raising and Lowering

At the end of this topic, a student, given types and positions of anchors, different rope systems, slings, and mechanical advantage equipment will be able design and implement measures for mitigating a large animal rescue, so that the threats are reduced or animals are removed safely minimizing further harm to large animals involved.

As with human rescue, ropes systems are preferred for animal rescue for several reasons. They are flexible and easily adapted to a multitude of situations including raising, lowering, horizontal moving and vertical lifting. They are portable, and can be used in remote areas that vehicles can't access. Rope systems can be reconfigured depending on the number of personnel available and the load being moved. They are only limited to the amount of rope and hardware on-hand, but technique, like piggy-backing, can make the most of available equipment.

One of the most important aspects of using rope systems as opposed to mechanical systems is feel. That is, we can feel the load, we feel when the load increases, and can vary the operating speed. Mechanical systems pull through changes and operate at a fixed speed which can result in catastrophic injuries.

In this chapter, we will provide basic information for the raising, lifting and lowering of animals, especially large animals, adaptations for rescuer safety and changes in operational procedure.

Building a system to rescue a 45 lbs. dog from the bottom of a cliff is different than building a system to lift a 1,000 lbs. horse that will require additional mechanical advantage and stronger anchors.



Photo Felton Fire Dog Rescue

In a normal human rescue, operations are under control and may use complex systems, but in a straight forward, predictable path. With an animal, we may not have perfect control over the victim that can weigh up to 2500 lbs., that is unpredictable and can place extreme shock loads on the system.

Most human rescues utilize a 3:1 rope system, whereas a large animal rescue may dictate a 4:1 system or greater. Keep in mind that the system's limitation is its weakest link.

This course will not be providing the skills required to assemble and operate appropriate raising and lowering systems, but will review the observations, adaptations, and considerations

needed to perform a raising and lowering operation for large animals. The operation of rope systems requires specialized training that is beyond the scope of this course.

Raising and lowering guidance and standards have been established and are referenced in the (National Fire Protection Administration) NFPA 1670 Standard on Operations and Training for Technical Search and Rescue Incidents and NFPA 1983 Standard on Life Safety Rope and Equipment for Emergency Services. Remember that these standards are for humans, not 1,000 lbs. animals.

Given the training required to competently setup and operate rope systems, these operations need to be performed by the appropriate AHJ (Authority Having Jurisdiction). Given the wide variation in the training levels and equipment caches available to these AHJ's, this course will provide guidance in adaptation.

First, we must consider the basic issue with all ATR's, mainly that our victims are alive, may be quite heavy and unpredictable. Therefore, we must be prepared for a victim that could react with flight or fight at any time.

Incidents such as off-road accidents, trailer accidents and structure collapses usually require the mechanical advantage of rope systems and ample staffing.

The reactivity of horses coupled with their lack of depth perception can land them into difficult situations. Horses can go over the side of a steep ravine, fall into holes or trenches, become stuck in the mud or lodged in between trees. This same reactivity will dictate that rescue strategies be flexible and adaptable. These incidents call for the merging of Rescue Systems 1 skills together with an understanding of horse behavior and characteristics.

Rope systems need to be able to accommodate a heavy load that is dynamic, sudden shock load, and adapt to changes in direction and pick point

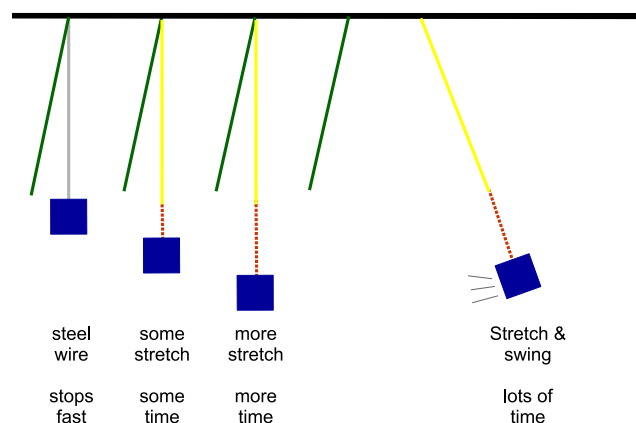


Image Brad Silen



Photo Tuolumne Animal Control

The terrain can add friction and impede the haul with obstacles like branches, loose rocks, and overhangs, and in this case a mine shaft with a brahma in it.

Anchors must be able to handle side loading should the animal decide to take flight, as in this lift with an Air-Shore Bipod.

All of these adaptations help make rope operations safer and more flexible.

There are basic adaptations that are incorporated into the system for flexibility of use and safety.

1. A “cut-away”
2. A load-transfer
3. Piggybacking with anchor ropes and haul ropes
4. Tandem prusiks
- 5.

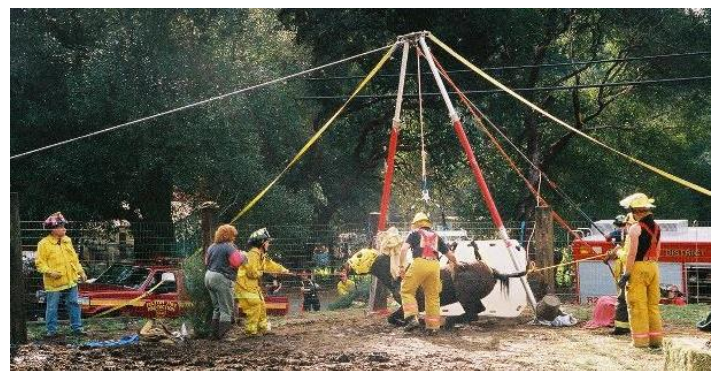


Photo Elizabeth Fox

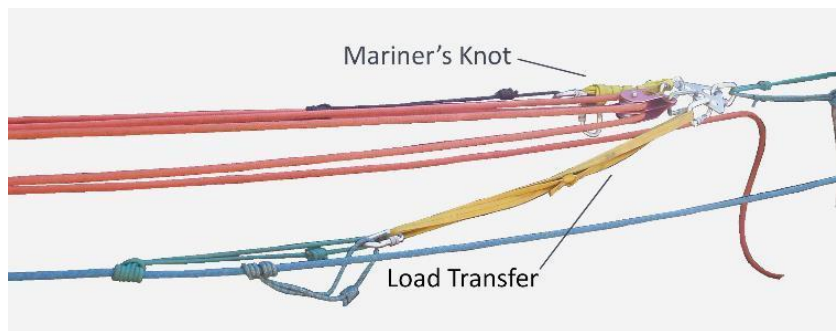
Cut-away



The “Cut Away” is built out of a length of 1” web that joins the rope system to prusiks on the haul rope in a double loop, carabiner to carabiner. The web can be easily cut with a rescue knife or trauma shears to separate the animal from the haul or lifting system. A second cut away is placed between the rescue strap and the haul rope.



Load Transfer



The “load transfer” is placed into the rope system when using a “haul rope”. The load transfer is attached to the haul rope with tandem prusiks. The opposite end is attached to a gathering plate or anchor. It serves two functions. Should the animal place a sudden shock load on the system, the load transfer acts as a hard stop on the haul system so the haul team is not subjected to the sudden reversed load. It is also used to transfer the load off the hauling system so that the haul system can be re set or extended.

Load Release Hitch

The load release hitch is placed in the haul system to release the load in case the system gets jammed. It can also be used to convert from a lowering system to a raising system while under a load ex. – if a victim is stuck on the middle of a cliff

A Load Release Hitch can be purchased commercially or made out of webbing or rope. The Mariner’s Knot or Radium Hitch allows extension of a load on the system.





Difficult terrain or lack of anchors may make it necessary to either attach a system to an anchor rope or attach a haul rope to a fixed haul system (A PIG system). This technique has two advantages. The first is that the system and haul team can be located a safe distance from the animal. The second advantage is that a system of limited length, such as a 4:1, can be set and reset over an unlimited distance, allowing rescuers to take advantage of remote anchors. Animals may not respect a system reset and may power through it. **Anchor Rope** - Used to adjust the anchor "point"



Key Point Good chemical control is essential when an animal is packaged onto a backboard or “Glide”. Attempt to haul from finish to start without resetting or direction change. If you must reset your system or change direction, find a suitable area where you can shelter the animal in place.

Tandem Prusiks



Tandem Prusiks add additional safety, flexibility, and shock load insurance. The addition of two or more prusik sets in a system gives two or more locations that can “slip” and help absorb any shock load.

In general, the use of ropes and rope systems is preferred however, at times, mechanical system may be used if ropes are not available.



Ropes

Portable, in backpacks
Electric
More versatile

More readily available

Mechanical Equipment

Need vehicle access

Harder to adapt

Need to request

Rope systems are portable, easily changed, adapted, moved and extended. They are much easier to request as most every fire department has rope systems, webbing and other rescue equipment readily available, and are capable of requesting addition equipment from other agencies.

Heavy equipment, such as cranes, tractors and helicopters are a good resource for incidents that occur in accessible areas. Heavy equipment has greater capacity to lift or move heavy loads and require fewer personnel for operations. Certain pieces of heavy equipment, such as mechanical winches, have a lag time that may complicate operations. Electric winches will have a limited duty cycle that can cause battery drain and overheating if it is exceeded. Heavy Equipment can serve as bomb proof anchors and may provide a high pick point.

- Winch
- Tow truck
- Crane
- Tractors, backhoes, bucket loaders
- Helicopters

In general, we avoid using any mechanical equipment. When these mechanical systems are placed into use, several things need to be taken into consideration. Availability, most of these resources need to be requested from private businesses and may not be available at the time needed. There may be a cost associated with their use, or a utility company may donate their time and equipment for good PR. The operators may not be familiar with a rescue environment, organization or communication. Most of these systems are vehicle based and thus the vehicle must be able to access the scene. Once on scene, the vehicle needs to be stable, cranes need to be on a flat surface. These systems are generally limited by the cable that they have onboard and are difficult to adapt to a change of direction should something go off track, and winches operate at one speed. These devices have no “feel”, should the animal or the system get hung up on an obstacle. With cranes, consider that in an area with trees or buildings, they may not be able to “swing” their boom.

Ropes

Give us a “Feel”

Variable speed

Requires sufficient staffing

Mechanical Equipment

No Feel

Fixed speed and lag time

Needs less staffing

Capstan Winches are either portable or vehicle mounted. Vehicle mounted devices have the same limitations as other vehicle mounted systems. Portable capstan winches were developed primarily for use by game hunters and so are designed and rated for this operation. The basic concept of the capstan is that unless tension is placed on the haul rope the winch will not move the animal and thus gives a feel as to the load on the system. There is no lag time for halting

operations, simply stop pulling. The capstan can be combined with a 2:1 or 3:1 system to provide more power and help the motor.



Photo Simpson Winch Co.

Anchors

Anchors need to be appropriate to the animal's weight. Consider the potential shock load to the system.



Image Brad Silen

Anchors should be “bomb proof”, or rated for the load with a safety factor. An anchor can be backed up with a second anchor, or two anchors can be used in tandem as long as they are close together.

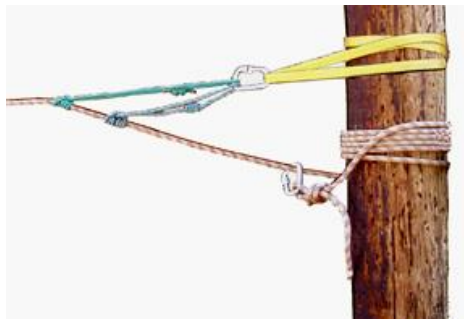


Photo John Fox

Raising or Hauling Systems

Rope Systems

- 2:1 For every 2 feet of pull, load moves 1 foot
- 4:1 For every 4 feet of pull, load moves 1 foot
- Z-rig (3:1) For every 3 feet of pull, load moves 1 foot

These systems have a limited working length.

For a 1200 lbs. animal, a 4:1 system will need 8 or more rescuers on the haul team.

Lowering Systems

Sometimes it makes sense to lower the animal to safety.

Reverse the haul system

- 2:1
- 4:1
- “Z-rig” (3:1)

Include a standard friction device

- 8-plate
- Brake rack

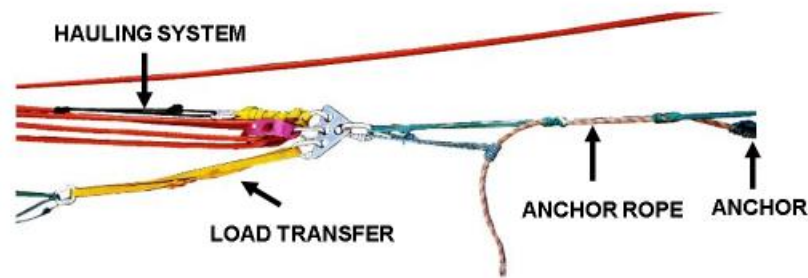
Re-set or Rest points

Given the need for 4:1 or greater systems, the working length is greatly limited, requiring a reset and thus a transfer line. Animals will generally lie quietly during a haul, but when the haul stops, they will attempt to get up.

After choosing an appropriate hauling system, determine the “Working Length” of the system. Determine stopping points along the haul path. These stopping points need to be areas within the working length of the system and areas large enough to accommodate any of the animal’s movement or thrashing. These rest stops are used to allow for the “Re-setting” of the system and to allow for “Rest Stops” in case the Handler is having problems. After the animal settles, the Handler signals for the transfer to proceed.

A high angle haul will dictate a high level of packaging to keep the animal from sliding off of the backboard or glide. It is imperative that the veterinarian deeply sedate or anesthetize the animal.

Piggy Backing



Attaching one rope or rope system to another

- A haul system is “piggybacked” to an extended anchor rope, or
- An extended haul rope is “piggybacked” to a fixed haul system

Photo by John Fox

When constructing any haul system, it may require attaching one rope or rope system to another. In these situations, a haul system is “piggybacked” to an extended anchor rope, or an extended haul rope is “piggybacked” to a fixed haul system.

After an **appropriate** in-line anchor is established, determine the best system for the situation, determine the best position and pull direction for the haul team. This may require the use of an extended anchor rope to position the system and the haul team for safety and efficiency. Place a cut-away between the system and the animal so that, if needed the animal can be separated from the system.

Take into consideration the weight and size of the animal, the position and situation of the animal, accessibility, physical condition of the animal, injuries, level of exhaustion and cooperation. Also, consider:

- Terrain
- Vegetation
- Availability of in-line anchors
- Distance and angle of haul
- Access for heavy equipment

Hauling Operations

- Put halter and long lead on animal
- Gain control of the animal
- Establish safety zones for animal and personnel
- Apply rescue equipment
- Establish path for animal with rest stops if needed
- Set up the haul system

- Attach the animal last when the handler is ready

The animal handler is a critical member to support the animal. No operation should commence without first checking with the handler.

Haul System Review

- Choose an appropriate anchor
- Choose proper haul system
- Remember load is alive
- Operation must be flexible
- Attach animal to the system LAST
- Communications and Co-ordination on a long haul are critical

Be sure to have a plan for what you are going to do once you get the animal up the hill. Do you have transportation? Do you have a veterinarian standing by?

Trail Accidents

- Gain control of the animal
- Determine animal's injuries
- Determine appropriate rescue system
- Establish working and safety zones
- Establish escape routes
- Establish rest stops to reset hauling system
- Determine operations; prepare contingencies

When conducting vertical lifting we may use rope systems, mechanical Systems and helicopters.



This rescue required three rope systems. A 4:1 to lift and rotate, a 3:1 to move the animal vertical in the ditch and a 2:1 to move the animal downstream to a clearing.



Photo Felton Fire Department.

The prognosis seemed dim for this horse during the rescue, but after a rest and some IV fluids he was able to stand and walk the rest of the way home. The picture on the right shows the horse a year later.



Photos *Linda Richmond*



In this example, the horse slipped off of a bridge in a state park and landed upright in a deep, narrow, stream bed with no room to maneuver. The horse was lifted out of the hole, using simple equipment,

the vertical lift tie, ladder and a rope system. Rescue glide slip sheets were lashed together and used to reduce the friction as the animal was pulled from the stream bed. The horse was lifted with a 4:1 and 10 people. The picture on the right shows the change of direction pulley anchored high in a redwood tree. 2" web anchor strap choked into the bark of the redwood tree and the end of the strap served to keep the pulley away from the tree.

Lifting is a last option. No one lifting harness or system is applicable in all situations, stay open to considering the best application for the situation. Take into account the animal type, size weight and available equipment. Basic lifting systems include the vertical lift tie, the Large Animal Lifter, and the two-strap system.

All lifts should be as low as possible, generally to the "bent knee" position. In this position, the animal should attempt to stand, if not there may be something seriously wrong.

Whenever lifting an animal, always anchor the animal off at the rear of the lifting device, not at the tail, to prevent potential side loading the anchor if the animal "launches" when getting to its feet.



Lifting with the LAL and Air Shore Bi-pod, Liz Fox

When using an A-Frame or Tripod, always anchor in all directions, front, back and side load.

When conducting a vertical lifting operation, first, establish safety zones. The animal handler and operations needs to consult with the veterinarian to establish the level of sedation/tranquilization if appropriate. The equipment is assembled and sling placed on the animal. When the animal handler is ready, the lift may begin. A tail tie may be needed for stabilization. Expect the animal to scramble as it leaves the ground. Lift the animal to the bent knee position. If the lift will result in the animal being lifted off the ground, expect the animal to struggle as its feet leave the ground, don't pause the lift, at a certain point, the animal will submit and hang limp like a baby kitten when its mother carries it. Likewise, when placing the animal back on the ground, set the animal down on the ground, don't pause.

No matter how played out the animal appears, always assume they can come to life.



It is not always necessary to lift the animal out of a situation, consider sliding them up the side.



Photo Linda Richmond

Chapter 9 – Vertical Lifting and Helicopter

At the end of this topic, a student, given emergency ATR incidents and scenarios will be able to identify and manage equipment or resources as needed, so that scene management adaptations accommodate fluid scene setup or conditions, so approved operations are implemented or adapted with incorporation of safety considerations are considered and documented.

Almost all animals will resist being lifted off their feet, thus whenever a lift is being conducted rescuers must take extra precautions. Lifting should only be done if it is the only option or the best option. With the strong possibility of thrashing or some other reaction, it is essential to lift under the direction of a veterinarian. Depending on the situation, the veterinarian will or will not choose to sedate or even anesthetize.

There are two basic lifting sling systems that can be constructed from equipment available on a standard fire engine, the vertical lift tie (VLT) and the Two Strap system.

The **VLT** is a very old application used to lift animals. In the picture on the right, it is being used to lift this donkey across a ravine.



Frederick Remington's El Sabio from Buffalo Bill Center, Cody, WY Loan from Bob & Angel Coe

An updated version of the VLT is very versatile, not size or species specific and is made from readily available equipment (1 ½" single jacket hose, 2" webbing). Not all hose is rated for strength but many are. This lift will suffice when a commercially built sling is not available and it has saved the lives of many horses. The VLT may need to be adapted for other species with stopper knots or 1" web closures.

Vertical Lift Tie (VLT)



Place the center
over horse's withers



Tie a half hitch knot
at the horse's chest



Situate knot at the sternum
below the thoracic inlet

Photos by John Fox

Thread hose through Large Diameter hose to form a
breast plate for greater comfort.



Photos by John Fox

A commercially built breast plate can be purchased.



Feed running ends of the rope through
the front legs and up to the withers



Exchange ends forming an "X"
behind the withers

Photos by John Fox



Ends are brought down to the inside of each hind leg and exit between the hind legs.

The ends are brought up and joined with a half hitch knot above the dock of the tail.



Ends are both fed under the "X," brought forward, and fed under the neck loop.

Photos by John Fox



The ends are brought back over the "X," tucked between the two straps on the back, tucked under the "X", and brought forward to the neck loop again

Photos by John Fox



F

A piece of 1" web is wrapped onto the handle at the center of gravity. Per department protocols, a wrap 3 pull 2 can be used, or a larksfoot. A carabiner is clipped onto the web loop and attached to the haul line when ready rescuers are ready for the lift. The 1" web becomes a "cut-away" if the horse needs to be detached from the system readily.

This is a quick lift application. It is not comfortable. Only lift the animal off the ground if necessary. For most situations, the lift is only to the bent knee position, assisting the animal to its feet. Because it captures all four legs, this tie will always rotate the animal to its feet.

Advantages of this tie are:

- Lifts the animal from the center of gravity
- Captures each quarter of the animal
- Does not require any mechanical devices or hardware
- Low over-head lift point with attachment near the withers
 - Allows lift with low overhead anchor possibly 7 'or 8' high
- It is the only sling that will stay on a horse when it is not under a load
 - The horse can move freely when it is wearing it
- While many other slings will bring the horse up at an angle, the VLT will bring the horse to its feet

Disadvantages of this tie are:

- May cause pain or discomfort
- May cause thrashing
- May cause nerve damage if used longer than 10 minutes

The veterinarian should utilize pain management.

All lifts need to be restricted to ten (10) minutes or less. Be sure to use the breast plate which places support under the sternum and guides the hose away from the brachial bundles behind the front legs.

The goal of lifting an animal is to help it get back on its feet. The only time an animal is lifted "off the ground" is when extrication from a hole or similar situation is presented. Lifting is to the "bent knee" position and it is held in that position and encouraged to stand. If it does not try or is unable to stand the animal is placed back on the ground.



Photo Linda Richmond Lift with vertical lift tie

For lifting out of a hole, or pool situation, move the animal to the side, and place a slip sheet, salvage cover, or plywood between the animal and the wall and slide the animal up the side.

Caution needs to be taken when using knives around animals. Animals may move spontaneously and run into the blade or worse, push the blade into the rescuer. When working with animals, always use a round blade “Rescue Knife” or trauma shears.



2-Strap Lift

Commercially built 2-Strap lifting slings are available, but in a pinch, can be improvised with fire hose.

2 Strap vertical lift Materials:

1. 2 lifting straps (or Rescue Straps) 4"-5" wide 12-14 feet long.
 - a. These lengths can be adjusted using prusik loops
2. A “Chest” strap, 4"-5" wide and 2-3 feet long
 - a. Attached to the front lifting strap
3. A “Butt” strap in placed at the rump and attached to the rear lifting strap.
4. A Lifting/Spreader bar to keep the straps separated
 - a. The lifting straps are attached to both ends of the lifting bar.



Photo Tomas Gimenez

When ready, the lifting bar is attached to the haul system.

Advantages of the 2-strap lift:

- Easy and relatively quick to apply
- Relatively comfortable for the animal
- Easy to remove

Disadvantages of the 2-strap lift:

- Requires the lifting bar to keep the straps separated
- Requires a chest strap to keep the front strap from slipping back
- Requires a butt strap to keep the back strap from slipping forward
- Requires a high overhead anchor
- The lift must be parallel to the ground or the sling will not be secure and could come off
- If the animal is recumbent, lifting will bring it up at an angle with its feet offset

- The sling is not secure unless it is under a load

The 2-strap is also used for short, low lifts less than 10 minutes. Caution needs to be observed that the system does apply pressure to the internal organs in the rear. The rear strap may act as a bucking strap. The 2-strap system is not well adaptable to smaller animals, especially if their legs are not “outboard” from the body. Given that the straps are around the “barrel” of the animal, they tend to lift the animal at a 45 degrees angle. This could be used to advantage or it could be a disadvantage depending on the situation. A commercially built 2-strap sling is available.

Commonly Available Lifting Slings

Large Animal Lifter (LAL)

This system is an adaption of the VLT that incorporates a lifting bar. The breast plate supports the horse at the sternum.

Padded web straps radiate out from the breast plate to distribute the load across the rib cage. The back straps of the LAL are supported by the butt straps.

The new lifting bars are shorter.

Key Points:

- The lifting bar must be oriented in the correct direction or the balance will be thrown off
- The breast plate must not extend more than 3 fingers behind the elbow or the balance will be thrown off
- If using a tripod, the animal must not move past the legs or the tripod can collapse
- If using LAL with a cow, the breast plate can move into the thoracic inlet and cause the cow to pass out
- For a recumbent horse, the straps can be passed through the front and back “doors” or pathways



Photo John Fox



Photo Felton Fire

The lifting bar can be adapted to several alternate lifting systems.

In all lifting situations, expect the animal to potentially panic and lunge forward. Therefore, attach an anchor line from the rear of the lifting device to an anchor to prevent the animal from moving the angle of the lift which could result in a failure of the lifting system. Tractors are good lifting systems however, especially with the front bucket extended up, they are subject to side loading. Note, the red webbing tied to the back of the lifting bar. This line is tied to a strong anchor. This is to prevent the animal from “launching” forward and side loading the tractor. Notice the lead line and tail tie. In this situation, they are being used to keep the horse oriented perpendicular to the tractor. Watch out for the owner!!!



Photo Felton Fire

The “Net System”

The net system utilizes a belly net in place of straps and uses the lifting bar. The net is made of expandable fabric that allows the belly to expand and the lungs to inflate. The load is shared by the front straps that run from the sternum and around the neck to capture the front quarters of the horse, and the back straps that support the back part of the horse. The net is compressible and can be pulled through the “front door” and secured into place under the belly. This picture shows the short lifter bar.



Photo Creative Commons

Historic inspiration for this system came from belly bands used to lift horses on and off ships.

This band is probably made from heavy canvas. The slight tilt of the head by the lead line helps to counter the pick point which is behind the center of gravity.

The “E-Z Up Cow Lifter” which is designed for supporting dairy cows but with the addition of a chest strap, can be used for lifting horses and other large animals.

Key Point:

The “pick point” on this sling is behind the center of gravity of the horse.



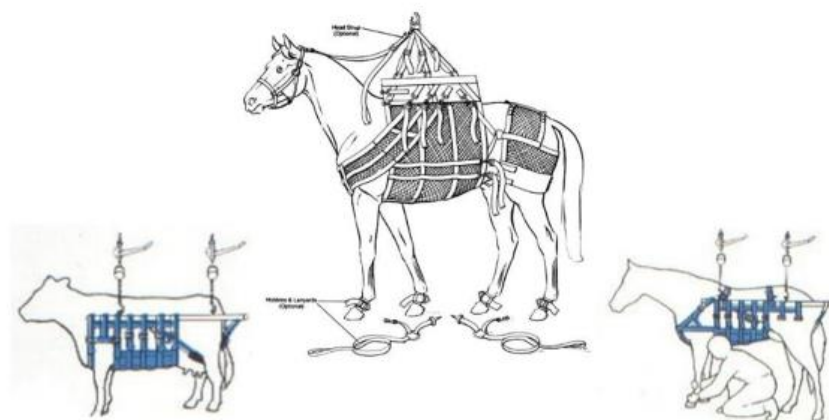
Photo Allan Schwartz

Variations of this lifter include this one that would require a higher overhead anchor.



Photo Daisy Cow Lifter

The “Liftex” system, top center, is composed of a central net and a chest and butt plate. This sling is not rated for helicopter lifting. It has been used successfully for that purpose, but was only secure because all the gaps were closed off with 1” web and a secondary sling was put underneath (VLT).



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21

The Wiggins systems that is designed for supporting dairy cows for milking and horses for a farrier to use

for shoeing or Vet for medical treatment. The Wiggins uses a metal “U” frame that is mid-animal and thus this lifter is not well suited for rescue of a down animal.

For cattle, the “Upsy-Daisy Cow Lifter” goes on recumbent cows easily and lifts them onto their feet.



For sustained lifting in excess of ten minutes and for air lifting of large animals the “Anderson Sling” is available. Designed for clinical use, the sling has been proven useful in rescue situations and is the only approved sling for air lifting.



Photo Charles Anderson



Photo Tomas Gimenez



Photos by John Fox

The Lead line is daisy chained to allow a quick pull upon landing.



Photo LAR Co.

Lifting large animals by their feet is dangerous at best but can be done with care. It is essential that the animal be anesthetized when lifted because any struggling can damage the legs. It is also essential that the head be lifted at the same time because that will take a hundred pounds or so of weight off the legs.



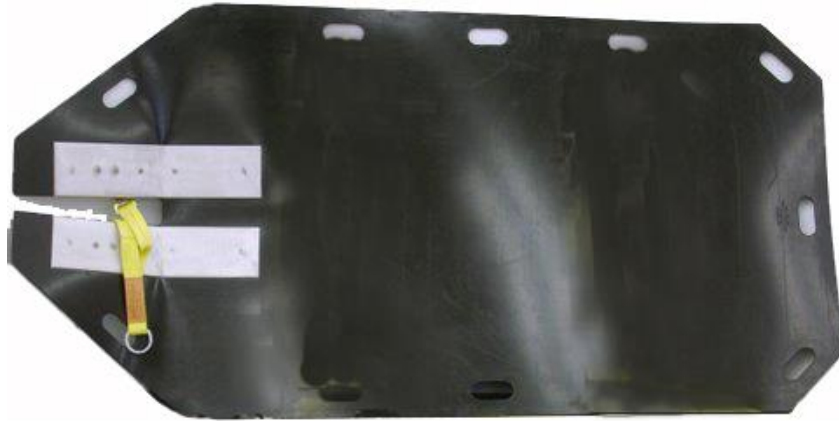
Photo Ventura County Fire

In this photo of a horse being lifted from a ravine, the veterinarian has absolute chemical control. The head is lifted with the legs and for good measure, there is a rescue strap under the withers to take the load of the body.

Tractors, knuckle boom cranes and heavy-duty tow trucks are all options for lifting. Ensure that they are placed on solid ground and be cautious of side-loading.

Large Animal Backboard with slip sheets (see ATR Awareness Equipment)

An alternative to lifting a recumbent large animal is to haul it on a backboard. It is constructed with a high-density polymer material, a sloped front edge and metal fittings and D-rings to attach a haul line to.



The backboard is used as a means of moving a recumbent horse a distance, up or down a hill or in to a trailer.

Along with this back board are Slip-sheets, flat high-density polymer sheets that have multiple uses. They are primarily used to go over minor ground obstructions, used as a ramp to go into a stock trailer or horse ambulance.

When using the backboard on flat or slightly sloped ground, sedation and hobbles are optional and may be counter-productive. Most animals are less stressed if their hooves are left free. The weight of the animal will suffice to keep it on the backboard and it will not try to get up as long as you are hauling.



Photo Elizabeth Smith

Protect the head with a clinical head protector, blanket, life jacket or even a big dog bed.



The back board can be used in conjunction with a rescue strap in low angle situations where the animal may slide off the backboard. In general, packaging may also be done with 2" webbing or Wildland hose as this allows for injuries and terrain considerations.

This method of packaging is more involved, may require sedation, and utilizes piggy backing to pull the horse and the backboard together. **This is only for short low angle hauls.** Note that putting the rear end of the horse on the "kick-up" enables the veterinarian to tend to the head without fear of being run over.



This more extreme form of packaging requires absolute chemical restraint. It is for high angle situations where a lift is not possible. Pay close attention that there is sufficient support at the end of the backboard to keep the animal from sliding off. Avoid tight strapping that could cause nerve damage, but close off any openings that the animal could slide through with the pull of gravity.



Photo Charles Anderson

Miscellaneous Equipment

Real horse ear plugs are available or can be constructed using stockings filled with cotton balls, like pompoms. Ear plugs and blindfolds need to be cautiously applied. Not all animals will tolerate them. A good blind fold can be made using a Velcro style fly mask with a light towel sewn into it. Given that the animals may react to either ear plugs or blind folds, they must be easily removable.

When dealing with small animals, they can be contained in several ways, most commonly by using cages, harnesses, slings or bags.

Helicopters

- May be the best option
- Is extremely high risk
- Requires adequate staffing at lift and land zones
 - Including veterinarians at both ends for equines
- Requires rated sling
- Requires training for the rescuer and the pilot

Helicopter can be the best choice for lifting, depending on conditions. It is a vehicle for all species that is best carried out by animal trained pilots and rescuers. Ideally, they have all trained together. The helicopter must be set up with a detachable lifting mechanism so that if there is an emergency they can jettison the load. Note, rescuers and others need to be aware of this potential situation as it can be very catastrophic and will challenge public relations.

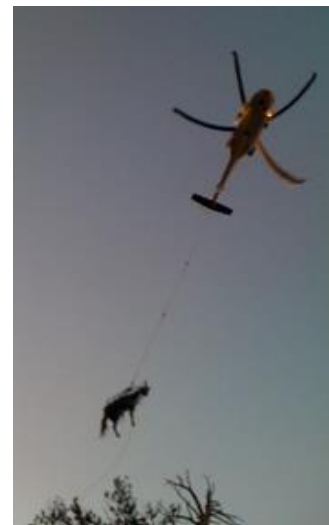


Photo Soleil Dolce

Criteria for Helicopter Lifting

- Clear landing & lifting zones
 - Adequate clearance of wires
 - Tree canopy appropriate for “penetration” entry
- Clear weather
 - Hot weather can hamper lift
- Helicopter rated for lift load
 - ICS typing in FOG
- Field communications are HUGE
 - Hand signals are a backup, but only a backup

There must be a safe area for lifting and a safe area for landing that is free of obstacles and hazards. The pilot will decide if the landing and lifting zones are adequate and if the conditions are safe. Certain tree canopies, such as the redwood tree canopy, will require a long line to reduce hazard of self-pruning redwood limbs.

Commercial aircraft radios and emergency responder radios must have the proper channels to support communications, and a designated radio operator on the ground. Commercial radios are not compatible with first responder frequencies. All of the criteria for helicopter lift must be met.

Scene Set-up

- Landing and lifting zones with IC & Safety Officer each
- Fire Department staging
- Veterinarian staging and care
- Sling Team staging
- Horse handler if veterinarian prefers
- Press location
- Support location
- Location for animal ground transport

It will be helpful to plan this ahead of time if possible.

Scene Management

- Operations led by Fire Department
- IAP established
 - Common goals, Backup hand signals set by pilot

- Checklist established
- Terminology/Radio contact confirmed
 - At take-off and landing
- Landing zones swept for hazards
- Lead line is attached

Helicopter operations are best run by the Fire Dept. Incident action plan (IAP) must be established and followed impeccably. Hand signals are considered to be a backup only to be used with other communications failure. The UC Davis protocol is to daisy chain the lead line so it can be pulled loose easily. Some rescuers have found front and back lead lines to be helpful when guiding a horse to the ground.

Generally, in all helicopter lifting the veterinarian will need to sedate horse, or other species. Helicopters have a very limited lifting capability and fuel range. When estimating the time needed for a helicopter operation travel to, travel back and on scene hover time need to be included. Radio communications with the pilot may be an issue given frequency limitations. Weather plays a major factor in any helicopter operation.

Scene Management continued

- Veterinarian sedates horse, or other species
- Team applies rated lifting sling, harness, or crates small animal
- Fire Department guides helicopter in
 - Team attaches slung horse to lifting frame, or, lift line to cage, or small animal harness
- Safety checks all around
- Team signals pilot to lift far enough to test load

The lifting team applies the rated lifting sling, harness, or crates small animal. In general, the Fire Department should guide the helicopter in as they have experience in helicopter operations. Once the helicopter is on scene, the lifting team attaches slung horse to lifting frame (which is usually brought to the animal by the helicopter on the lifting line), or, lift line to cage, or small animal harness

Safety checks all around are made. Only **one** designated person signals pilot. If possible, a slight load is placed onto the system far enough to test harness and allow for adjustments.

When conducting a helicopter lift, there needs to be both lifting and landing teams, with a vet at both ends.

Scene Management continued

- Landing and lifting zones must be in continuous communications
- Helicopter lands
- Handlers catch lead and rear lines
- Veterinarian tends to animal
- Team disconnects sling
- Veterinarian rehabilitates animal

Both entities must remain in contact in case something goes wrong. Any condition or development may cause the helicopter to return to the lifting zone. With communications, teams can track progress of flight and be on the spot ready for a quick disconnect of the horse.

A key requirement for dog slings or harnesses is that they are specific to that particular breed.

Crates can also be used for lifting small animals

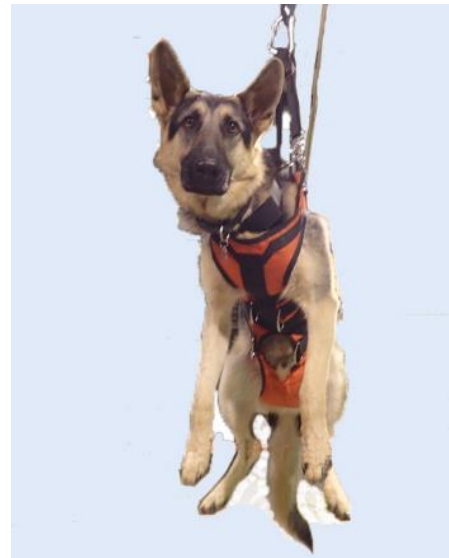


Photo John Maretti



CAL Fire & USFS Hand Signals

“Common Terminology” for Helicopter Hand Signals need to be established before operations start, please see handout.

Hand signals are only used as a backup, always have radio communication between the pilot and ground crews.

Helicopter Types 2012 Field Operations Guide

RESOURCE	RADIO CALL	COMPONENTS	TYPES			
			1	2	3	4
Helicopter	Copter	Seats, including pilot	16	10	5	3
		Card weight capacity lbs	5,000	2,500	1,200	600
		Gallons	700	300	100	75
		Examples	Bell 214	Bell 204, 205, 212	Bell 206	Hiller 12E3T

Lift by Helicopter

This horse was stranded on a sand bar in an AZ waterway when its rider was surprised by a flash flood. One horse drowned in this incident, but this horse was able to swim to this island. Here the team prepares to apply the lifting sling.



Photos Soleil Dolce



Photo Channel 3 News

Three ATR team members and the lift team veterinarian work together to hook up sling and safety equipment on the horse before doing a test lift with the helicopter. In this case, the sling was known to be large on the horse, and so as a precaution, a vertical lift tie was applied beneath and piggybacked onto the lift line so that it would engage if the outer sling failed.

Communication with the landing zone team is critical during the flight. A lookout is positioned to watch for any problems that might arise, in this case the horse was stable throughout the flight.



Photo Soleil Dolce



Photo Soleil Dolce

Here the landing zone team has identified two people to ‘capture’ horse lead lines on the head and tail and stabilize the horse as it is lowered on final approach. Landing zone IC ensures that only essential personnel are around as the horse lands. The landing zone vet has instructed the team to surround the horse to block its view from the press, just in case the horse has suffered an injury in flight or landing that could call for euthanasia. The landing zone team rapidly removed the slinging and found only a minor rub from the sling and no other injuries.

The owner and family walk the horse after slinging was removed while the horse recovered from sedation, the press was instructed to wait for the horse and family to approach them, which they did when they were ready.



Photo Soleil Dolce

Chapter 10 – Mud, Water, and Ice Operations

At the end of this topic, a student, given animal behavior aspects, appropriate resources for water and mud incidents, will be able to identify the adaptations needed to manage scene setup, so that operations, safety considerations for incidents involving an animal stranded in mud or water with application of practiced skills and industry standards.

Mechanisms such as rider error, trail collapse, or bridge failure can land a horse into mud or water. Horses or other large animals will occasionally find themselves trapped in swimming pools or will venture out onto frozen water only to fall through or wander out into a bog. The animal's ability to extricate itself depends on the mechanism of the accident and the mud, water or ice conditions.

Animal rescues are inherently dangerous. Animal rescues in mud and water pose additional dangers and dynamics for the rescuers. A knowledge of water rescue is imperative to stay safe. This module is not intended to take the place of water rescue training but serves to offer suggestions, cautions and adaptations.

Animal Behavior in the water

In general, horses and other animals can swim, they will keep their heads above water as much as possible. Remember that horses are obligatory nose breathers and can't breathe through their mouth. Don't allow halters or bridles to slide off of supporting nasal cartilage and collapse the airway.

When in deep water, legs paws and hooves will be especially dangerous. Because of the animal's thinner legs and strength, they can move their legs through the water much faster than we can. In deep water, a horse swims effectively by thrusting its legs in in a pumping action. The legs extend forwards and backwards with little lateral movement. Horses can't see where they are placing their hooves in the water. A rescuer who is too close could easily be struck by the legs or hooves as the horse swims or scrambles for sure footing.



Photo by Kurt Arrigo

Land based animals are not designed to be in water. When they are submerged, they lose body heat rapidly and go hypothermic. As with humans, cold can mask pain and injuries. Animals in water or in any cold environment may be more seriously injured than they present. Horses in the water may appear exhausted but may still be able to act with considerable force. Factors such as injuries, confinement (fall into a swimming pool, septic tank, ice, mine shaft), water temperature, water movement, and water depth will determine the degree of intervention necessary or possible to help the victim. Extended exposure may lead to shock or hypothermia. Because of that, time is of the essence in a water rescue.

Rescuer Safety

Rescuer safety in any water situation is paramount. Water puts ATR rescuers at a disadvantage with unknown footing, slowed reactions, and variable water conditions. More so than a human victim, the animal may be confused, uncooperative, and panicked. In the case of a swift water rescue, rescuers must lower their expectations of success.

Rescuers must have proper PPE including a wet suit, helmet, Personal Flotation Device (PDF). If the rescue is on ice, PPE is the same except the wet suit is replaced by a cold-water suit or dry suit. Rescuers within 10 feet of the bank must be tethered.

Rescuers must read the attitude of the animal, conditions of the water and recognize hazards prior to any involvement with the victim.

Water Conditions

Water conditions can impact the success of rescue in many ways. Swift water rescue trained responders are better equipped to assess conditions. Considerations will include:

- Temperature
 - Working time before animal becomes hypothermic
 - Type of PPE for rescuers
- Rate of Flow
 - Directly corresponds to the level of risk
 - High rate is dangerous for the animal
- Clarity of water
 - Obstacles
 - Possible to go around?
 - Possible to remove?
- Depth
 - Tides

- Can water level rise?
- Can the animal touch bottom? Can the rescuer?
- “Landing zones”
 - Sufficient space to contain and stabilize animal
 - Consider the need for secondary rescue
 - Assist or haul or lift up a high angle bank

Water Rescue Algorithm

The low to high risk algorithm that has evolved for human swift water rescue can provide guidance for ATR rescuers. This algorithm, Reach..... Throw.....Go...Helo.... When dealing with an animal, especially horses, we modify the risk algorithm and first establish an escape route for the animal.

Escape Route

The escape route is the logical direction for the animal, assisted by water flow if in a river or stream, cleared of obstacles as possible, with sufficient “landing zone”. Avoid entering the water with an animal victim. Direct the animal out of the water from a safe distance. Under normal conditions, a horse's strength and survival instinct will drive it out of the water to high ground, especially if you can clear a path for it to follow.

Talk

From the landing zone, call to the animal, given their training they might respond, offer food as an incentive for greater effort. A horse that sees a rescuer and animals on land will know that that is a safer place to be and will try to go there. Use hay or rattle a grain bucket to encourage the horse's effort. Having the horse's best buddy nearby can also motivate it to try.

Reach

If it is possible, attach halters or lead lines to direct and assist the animal from solid ground with a long floating lead line. Lead lines should be water rescue rope that is highly visible. A dog might be able to bite onto an object and hold on.

Wade

In shallow water or still water, it may be possible to safely wade to the animal, attach a lead line or position yourself to drive the animal to shore. Only approach an animal if its attitude suggests cooperation. Rescuer positioning is critical. Only approach an animal from the neutral zones, give them and yourself an escape route. Any rescuer in a water situation needs to be tethered for their safety.

Assist/Tow/Haul

With an animal, we might next consider the application of minimal equipment including a lead line or leash to assist the animal out. While a small animal might be able to be captured and carried out, a large animal will need to participate in saving itself. Put a rescue strap in place to assist, tow, or haul the animal especially if the exit path is difficult terrain.

Lift

If a lifting system can safely access the scene, we can lift the victim out using a Vertical Lift Tie, 2 Strap Tie or other lifting device.

Helo

Helicopter lifting would be a last effort as it requires special equipment and training

About Lasso

Throwing a loop around the animal's head in water, especially moving water situations, is a last resort. In moving water placing a rope around an animal's neck may actually interfere with the animal's locomotion and cause injury or death.

As with other types of rescue your tactics should be as simple as possible and progress from the least invasive to the more complex. Rescuers should help the victim to help itself whenever possible.

Don't interfere with good effort. Left alone, these horses will land on shore safely.



Photo by Bonnie U. Gruenberg

Scene Management & Operations

Factors such as injuries, confinement (fall into a swimming pool, septic tank, ice, mine shaft), water temperature, water movement, and water depth will determine the degree of intervention

necessary or possible to help the victim. Water conditions may impede or prevent application of rescue equipment. Extended exposure may lead to shock or hypothermia. Because of that, time is of the essence in a water rescue, and it is vital to work with a veterinarian for rescue and follow up care.

In slow moving and swift water situations, the operations may need to move or stage downstream, systems may need to be mobile. Establish contingency plans, allow time to move personnel and equipment

Water Rescue Options

- Drive them out – from a distance
 - Place a friend on shore
- Lead them out
 - With a long lead line – Floating rope
- Assist them out
 - With a Rescue Strap
- Lift them out
 - Vertical Lift Tie
 - 2 Strap Tie
 - Anderson Sling

Rescue with Rope Systems

When it becomes necessary to assist or haul an animal out of wet conditions, rope systems need to withstand size, weight, and movement of the victim as well as the added pressure of moving water. The additional stress on the rescue systems makes it imperative to follow proper rope safety procedures.

In slow moving and swift water situations, the operations may need to move downstream, systems may need to be mobile. If personnel and equipment is available, establish a second rescue point downstream. Otherwise, time to disassemble, move and reassemble must be calculated based on water movement speed.

Floating rescue rope is essential for rescuer safety. We must know where the rope is at ALL times, especially in muddy water. Carabiner must be equipped with flotation devices.

Standing Water

- Direct or Drive animal to shore

- Get to the head and attach a long lead line
 - Keep the animal's head above water
 - Throw a loop around the animal's head
 - **This is a last resort**

Moving or swift water

In moving or swift water rescues, the odds of a successful rescue are diminished. It may be possible to establish a tension diagonal system or zip line, however, given the mass of a large animal, the impact on the rope system and anchor system will be multiplied. To help mitigate this increased load, set-up the system at a greater angle and if possible construct it at a bend in the water way as the natural flow should assist in pushing the animal towards the shore. Construct a zip line out of inflated fire hose to lessen impact on victim. Remember that only the head will be above the water and the animal will not grab the line. At best, we can only hope that the head will contact the rope or hose and help push the animal towards shore.

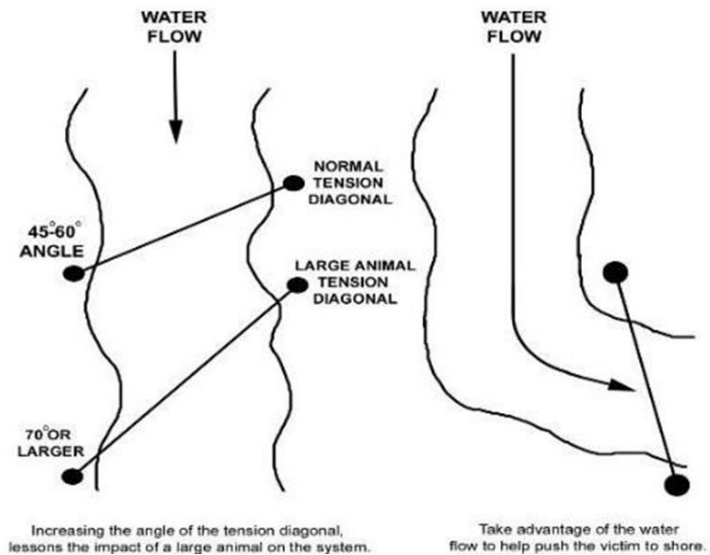


Image LAR Co.

Boats

Several precautions are necessary when using boats to assist animals. While it is best to approach animals as you would on land, water conditions may make this difficult and dangerous. If it is not possible to control positioning of the boat, don't use a boat. Watch the current and stay out of a position where you might be trapped between a solid object and the animal, or a position where the current can push you into the animal. Rescuers must keep the tails from getting caught in the boats prop, likewise keep any lead line out of the prop. Use of floating, visible lead lines will facilitate this.

Swimming Pool

In a swimming pool situation, we have several options. Rescuers need to remember, that animals cannot see their feet in water, don't assume that they will see steps. Draining the pool may allow them to see the steps. Direct the animal to shallow end. Assist up steps; given the slickness of a pool surface, equine rubber boots may be necessary for traction.

Any time a vehicle is placed near a pool remember that the area around a pool is usually fill, may not be compacted and thus presents a great risk that the vehicle will sink.

Consider a modified lift where the animal is lifted to a point where it can be "cantilevered" or rolled over the edge of the pool. Use an appropriate lifting system such as the 2-strap or vertical lift tie in conjunction with an appropriately rated sheet of plywood. Theoretically, with the haul rope from the animal placed over the top of the plywood, as the haul rope is pulled, the system will start to lift the animal and apply a leverage action on the top of the plywood. As the animal starts to lift the plywood will leverage over, lifting the animal on to the edge of the pool allowing the system to now drag the animal away from the pool.

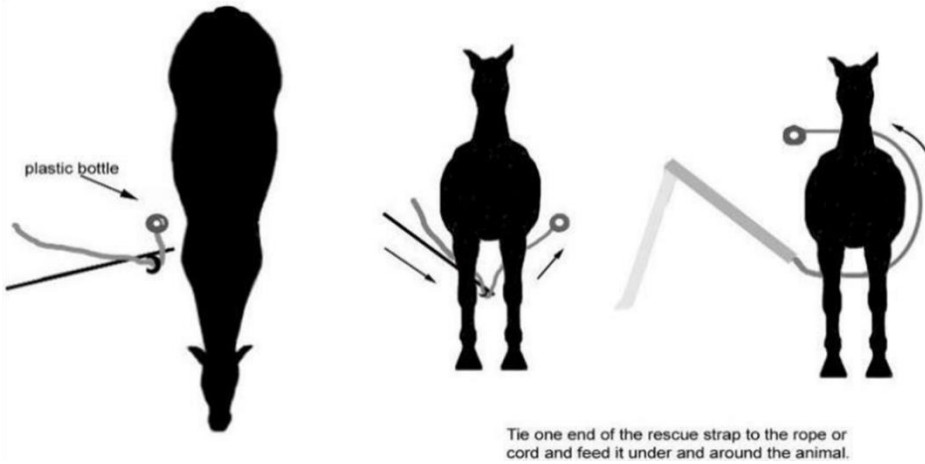
This same technique has been applied successfully without the plywood by "barrel rolling" the animal over the edge from the shallow end. In this technique, the straps closest to the pool wall are stabilized while the greater pull is placed on the opposite end of the straps to rotate the body over the side.

Assisting the horse or animal out

In a water or ice situation it may be necessary to assist the animal out. Applying a rescue strap in the forward assist configuration has been shown to be most effective. This allows rescuers to not only assist the animal but direct them to safety from a safe distance. With the rescue strap in this position around the girth, the horse is free to use its head to balance and gain impulsion.

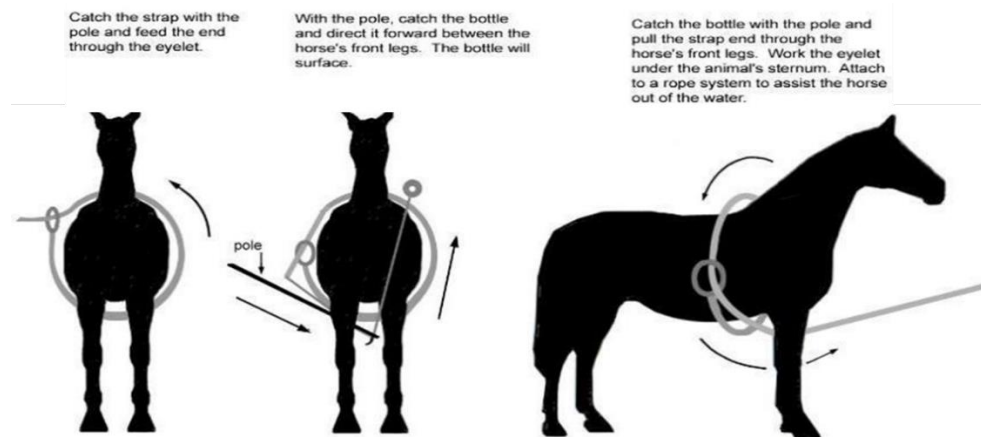
The trick is getting the Rescue Strap in the animal without getting in the water with the animal. To do so, rescuers need to get in a position alongside the animal using a boat, platform devices on mud, a ladder on ice, other means. Using a pole, 10' – 15' long (pike pole) feed a small floatation device such as an empty plastic bottle with 25' to 35' length of small diameter rope or heavy cord. To the end of this cord, attach one end of the Rescue Strap. As this operation is being conducted, a hauling system needs to be assembled and a haul line extended out to the animal. Using the pole, from the side, push the bottle under the animal's center, release the bottle and let it float up on the opposite side of the animal. Grab the float and feed the cord, then the rescue strap under the animal and up the opposite side.

Tie an empty plastic bottle to a heavy cord or light rope. Using a pole, push the bottle under the animal and let the bottle float up on the other side.



Images by LAR Co.

Run the float and cord through the opposite loop of the rescue strap and form a choker or larks foot around the animal. Again, feed the bottle under midsection of the animal, and forward between the front legs and let it float up. Using the cord, feed the rescue strap down and forward, between the front legs positioning the choker or larks foot low and between the front legs. Position the rescue strap and push the choke point as far down as possible. Once in place, attach the haul line. Pulling in this manner allows rescuers to direct animal from a distance. It allows free movement of the head and neck, helps keep head above water and the pull will help lift the body up.



The pull will help lift the body up and keep the head above water

Mud Rescue

Mud rescues are basically approached the same as a water rescue but with additional

considerations.

Animals that inhale water may have serious consequences, but animals that inhale mud face certain death. Therefore, we must stabilize the head above water/mud usually with some sort of floatation device, even a tire. Remember, horses are obligatory nose breathers. As with any rescue, rescuers must assess risks and situational awareness. Consider rescuer safety, medical issues and the environmental situation. Develop a strategy, include contingencies, review operations with all responders and assign teams.

Due to the limited access to mud situations and the instability of mud situation, lifting an animal out of mud in most situations will not be an option. Pulling them out will most likely be the first if not the only choice. Environmental issues may have a major impact on all involved. If the mud is stiff, it may be possible to dig a path for the animal.

If the animal needs to be moved some distance in the mud, consider placing a Rescue Glide/Back Board, behind the animal and again, cantilever the animal on to the back board. In this situation, the haul line is attached to both the animal and the back board resulting in both being pulled at the same time. This will make the pull easier and help **keep the animal on the back board.**

Free the Legs!!!

Before any extrication from mud is attempted, it is imperative to free the legs. The sole of the horse hoof is actually shaped like a giant suction cup. This, coupled with the width of the hoof, will create a vacuum that pulls on the hoof. The vacuum needs to be broken before hauling commences, using either air or water. An air injection device may be used however these will need to be pre-made with special fittings (in an SCBA bottle is used as the air source, the fittings are specific in design and for different pressure bottles). Water injection can be done using a piercing nozzle or a pike pole or other pole with a garden hose or "pencil line" taped to it. The pole is then used to deliver the water to the leg area. Water makes "slurry" around the legs that will last longer. With some types of mud, air has been known to "burp" out allowing the mud to refill the void.

Expect the animal to attempt to free itself once the legs are free and thus rescuers need to be ready to take advantage of this attempt. Given this possibility, the haul line and haul system are attached to the Rescue Strap, and tension is taken up before the legs are freed. Thus, allowing rescuers to take advantage of the movement. The area around the animal also needs to be ready, clear of equipment and personnel. This reaction may be quite violent.



Photos by Blake Finstad

This horse was freed from the mud by clearing mud and concrete that was obstructing the hooves. It was also necessary to remove barbed wired that was wrapped around the body and legs.



Note the tire used to keep the horse's head out of the water. This horse was pulled out with a rescue strap choked around the girth. Her legs were freed with a water stream from a hard line.



Photo Gary Sello A horse being assisted from a septic tank.



Photo Greg Malloy 1

Any kind of extrication from a septic or otherwise contaminated mud/water will necessitate DECON of not only the animal but the rescuers and the equipment.

As in the water rescue and ice rescue situations, the use of a Rescue Strap will most likely be the best option. As in the previous examples, a Rescue Strap is placed on the animal. How this is accomplished depends on the accessibility, mud type and equipment available. Sheets of ply wood

or a ladder wrapped with a tarp or salvage cover to spread out the weight may be used to not only access the animal but provide a work platform.

Ice Rescue

With an ice rescue incident, there are two basic rescue techniques depending on the ice involved. With thin ice situations, cut a path in the ice to the animal from shore. With this path in place the animal may be able to save its self or be assisted through the ice with the Rescue Strap. In thicker ice, with the Rescue Strap applied, we can utilize a modified cantilever method. Place a sheet of plywood between the animal and the ice edge, again the haul line is run over the top of the plywood, and attached to the Rescue Strap. As the animal is pulled, the plywood acts as a cantilever leveraging the animal on top of the ice. Once the animal is on top of the ice, a rapid haul is performed. This is done for two reasons, one, to help prevent the animal from standing and second sliding the animal off the ice before it breaks back through.

- Time is critical
- Establish a hauling system
- Keep a large area on shore clear for the animal
- Establish safety zones for personnel
- Attach a long lead to the animal
- Direct and assist the animal to shore
- Get near the animal using a Glide Backboard / plywood / boat
- Tether the rescuers
- Get a strap on the animal
- Establish a hauling system and a "landing area" on shore

- Establish safety zones for personnel
- Leverage the animal on to the ice with a Glide or plywood sheet
- Cut a path through the ice
- Pull the animal to shore
- Expect the animal to “explode” when it gets to shore

Chapter 11 – Animal Decontamination

At the end of this topic, a student given simulated scenarios and techniques for decontamination, will be able to identify situations and techniques for the decontamination of animals, so that considerations are evaluated for appropriate application of methods to complete ATR rescue techniques.

The intent of this section on animal decontamination is to provide basic information regarding hazardous materials incidents involving animals, as well as basic decontamination procedures. The process of first responder hazardous materials recognition, and decontamination operations is extremely important. Responders must first know how to recognize when a hazardous material is present, and be able to understand how the hazardous materials will affect the victim, responders, and the environment. Responders should be aware of how to set up, and safely operate a decontamination reduction corridor.

Occupational Safety and Health Administration (OSHA) is a federal agency responsible for enforcing safety and health legislation. The

HAZWOPER (hazardous waste operations and emergency response)

1910.120 regulation, as well

as the **California Code of Regulation section 5192**

regulate emergency responses to hazardous materials, in addition to many other hazardous material related operations.

One important section that they both regulate is that of hazardous materials response- related training.



FEMA Photo Adam DuBrowa Spraying Down Ashes at Middletown Fire

This section covers the basics of hazardous material response and recognition, but is by no means an approved hazardous materials course. We recommend that before any attempt is made to respond to a possible hazardous materials incident, you first seek proper training from a certified source. We encourage you to pursue further hands-on training from a certified source prior to conducting any hazardous materials decontamination procedures on an animal.

Animals can be exposed to a variety of harmful contaminants. They can be exposed as either a victim of a disaster, or as a responder to an emergency scene. Types of animals that may be impacted by hazardous materials include family pets, service dogs, Search & Rescue dogs, livestock, poultry, horses and wildlife.

Types of disasters that can impact animals include natural disasters (fire, floods, hurricanes, earthquakes), man-made disasters (chemical spills, gas leaks, unintentional exposure) and Terrorism attacks which include intentional exposures to chemical, biological, or radiological attack. Contaminants released by disaster include solids (fecal matter, particulates), liquids



(fuels/ oils, insecticides/ pesticides) and gases (toxic/ corrosive) and the mixing of incompatible materials.

Exposure types include inhalation, ingestion (eating, drinking, and cleaning), absorption, direct contact with the skin / fur, direct contact with the eyes and injection.

The objectives of decontamination are to 1) **limit the exposure area** and contain the exposed animal(s). 2) **remove or neutralize the contaminate** from the animal. 3) **Limit the animal's exposure time** to reduce the potential for secondary contamination.

As with any decontamination situation there are risks involved.

FEMA Photo Andrea Booher

Human safety is the top priority. These risks include not only the contaminate involved but the type of animal and its training and temperament. Sufficient resources will be needed to handle the number of animals and types of animals.

USAR Dogs

USAR dogs are particularly exposed to toxicological hazards in their search and rescue work. Common exposures include hydrocarbons, PCPs, hazardous metals, asbestos, gases, soaps, detergents, acids, alkalis, ethylene glycol, propylene glycol, phenol and alcohol. Dogs are exposed to these through inhalation, direct skin contact, and ingestion. Some of these toxins can have immediate or long-term health effects. Canine handlers routinely carry out mitigation or



Photo by Mike Stornetta



FEMA Photo Mike Moore

removal via Decon protocols. Animals that are trapped in a disaster, will be exposed to the same substances.

DECON Issues

When conducting an animal DECON, a large area is required, large amounts of water are needed which presents potential run-off issues. Consider contaminated objects such as collars/ leashes, saddles/ halters, blankets. Additional considerations will include local regulations, required notifications and approved removal procedures for contaminated water and equipment.

Initial Priorities

Did you **SIN**? It is the new catch-phrase that is being used in the hazardous materials world. **Safety** is obviously the number one priority, followed by **isolating** the area, and **notifying** the appropriate people.

When approaching any scene, make sure to provide for the safety of your crew and yourself at every call. Don't get tunnel vision on the perceived hazard. Gather all the facts, and obtain the big picture first before committing any personnel to a potential hazardous environment. This will prevent you from missing any important information, and unnecessarily exposing members to a hazardous environment. When approaching the scene, treat each call as a hazardous materials incident until proven otherwise. Approach the scene slowly from the uphill, upwind, and upstream side to prevent possible exposure to responders. When the presence of a hazardous material is confirmed, begin isolating the area.

- 1) **Isolate any entry points to hazardous area**
- 2) **Establish perimeter between entry points**
- 3) **Control Access to area**

When animals are involved, be sure to separate the contaminated from the non-contaminated. Attempt to contain the contaminated animals within the hazard area to prevent secondary contamination.

Every response jurisdiction will have its appropriate agencies that will need to be notified during a hazardous materials incident. The names may vary but the functions will usually be the same. The location of the incident, the size of the

release, and nature of the hazard will determine whether or not notifications to either local, state or federal agencies will be required. Failure to notify these agencies of a hazardous materials release could result in a lack of available resources, lack of monetary reimbursement, and even incurred penalties. When it comes to making the proper notifications, start with notifying the fire department. They will be able to assess the scene, and determine who will have responsibility for the area. The next important contact will be to the local county health official or the Certified Unified Program Agency (CUPA) Representative. They will be able to determine the true impact of the hazmat, gain access to the additional resources, and determine whether or not state or federal agencies will need to be notified.

As required within OSHA 1910.120, when first arriving on the scene of an emergency, appointing a single **Incident Commander** (IC) will help to increase coordination, increase crew effectiveness, and will help to limit further spread of the contaminate. When the fire department

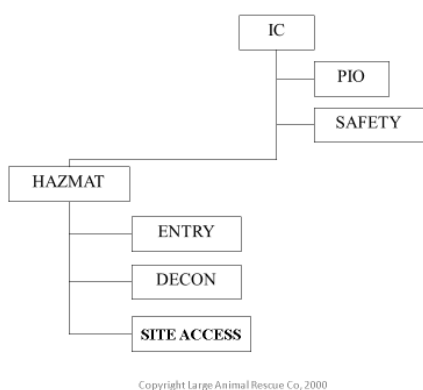


Image Jason Smith

arrives on scene, information should be passed to the officer-in-charge who will either assume command, or designate an incident commander of the incident. Once the ICS system has been established, per OSHA regulations, a scene **Safety Officer** must be appointed. A few other key ICS positions that should be filled during a HazMat incident are the **Public Information Officer**, and **Hazmat Group Supervisor**. The Public Information Officer will assist with managing the media on scene, which will be overwhelming at times. The Hazmat Group Supervisor will manage all hazmat related actions to

include; entry, DECON, and site access control. Remember that constant communication, coordination, and discipline are all key to making the ICS system effective at any incident.

The chart to the left shows the basic ICS positions that should be utilized during a hazmat incident. More in-depth ICS structures can be established based off of the complexity of the situation.

There are basic types of decontamination. The first of these is **Gross DECON** which involves rapid decontamination, and is reserved for emergency applications where no run-off containment is needed. **Precautionary DECON** is a more formal set-up using multiple catch basins, scrub brushes, neutralizing formulas, and other materials to form an assembly line-like path. Precautionary decontamination can be used as an additional form of decontamination for those animals that are symptomatic, and have already gone through emergency decontamination, or it can be used as the primary DECON performed for those animals that show no signs, but may have been exposed. Setting up precautionary DECON will take longer

but it ensures that no contaminated animals or contaminated run-off will leave the hazard area. **Responder DECON** is used to decontaminate those personnel that were within the hazard zone. **Mass DECON** is a form of emergency decontamination that is reserved for rapidly decontaminating large groups.

Establishment of a Haz Mat operation starts with defining **three zones, Hot, Warm and Cold**. The HOT zone and the WARM zone are both restricted areas. The cold zone will have the animal containment and final examination area. When establishing a DECON area consider location, uphill, upwind, flat and level ground and within easy walking distance from the Hot Zone. There also needs to be an ample supply of water and the ability to collect the run off.

DECON Equipment

Brushes, Buckets, DECON pools, showers, Large tarps, Hoses, Cones/delineators, Caution tape, Soap, Sponges/brushes, Towels, Plastic bags.

As with all DECON situations, the equipment needed will depend on the animals involved, the number of animals and the contaminate.

Personal Protective Equipment

HAZ MAT responders need, as a minimum: Goggles, Gloves, Waterproof suit, Respiratory protection

Animal Handler

The Animal Handler could be the owner depending on the situation. The handler must maintain composure, be able to handle the animal, and should follow the animal through the process.

DECON Step 1

- Exposed or Contaminated?
 - Have they been exposed?
 - Have they been contaminated?
 - Are they showing signs and symptoms?
 - If they are, consider rapid gross decontamination
 - Remove contaminated articles
 - Re-secure the animal with a non-contaminated restraint device

DECON Step 2

- Wash – Rinse – Repeat
 - Wash from top – down
 - Include rinsing the eyes with a saline solution
 - Apply the approved solution
 - Rinse with lukewarm water if possible
 - Focus on the head area and under any folds/ creases
 - Repeat at least 3 times for best results
- Consider the animal's temperament
 - If they are aggressive use a form of restraint

DECON Step 3

- Confirm decontamination
 - If there is still contaminate on the animal
 - Re-decontaminate following the same procedures
 - If there is no contaminate
 - Move animal to the cold zone
- Additional decontamination
 - If they are exposed to a suspected bio-hazard
 - Use an anti-bacterial solution to remove the biohazard from the animal

DECON Step 4

- Within the Cold Zone
 - Re-confirm effective decontamination
 - Move to a triage area to be monitored by a veterinarian

Unfortunately, in an animal situation, given the type and extent of the exposure, especially in the food industry, euthanasia may be the best choice. This option is qualified by the survival expectancy and usefulness of the animal, as well as potential herd exposure. Example, a biological exposure to poultry where the disease spread may jeopardize the entire flock.

Resources

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Chapter 12 – Small Animals

At the end of this topic, a student, given canine and feline elements and factors will be able to adapt and administer ATR skills, so that appropriate actions or skills are delivered to small animals while considering alternative means.



Getty Images

Dogs have served in war as messengers, guards, and to locate wounded soldiers and bring medical supplies to them.

Operating, usually under the cover of night, they would bring a hat or piece of clothing back to indicate wounded or dead. Airedales have been found to be especially determined and focused on mission. In one tale, an Airedale rescued his battalion that was surrounded by the Germans. Heroically he made it through enemy lines, even having been shot, to deliver the request for reinforcements.

Dogs continue to have military and public service roles today.

Dogs help to rescue people as companions and service partners, but there are times when they become the victim.



Photo Soleil Dolce



Getty Images

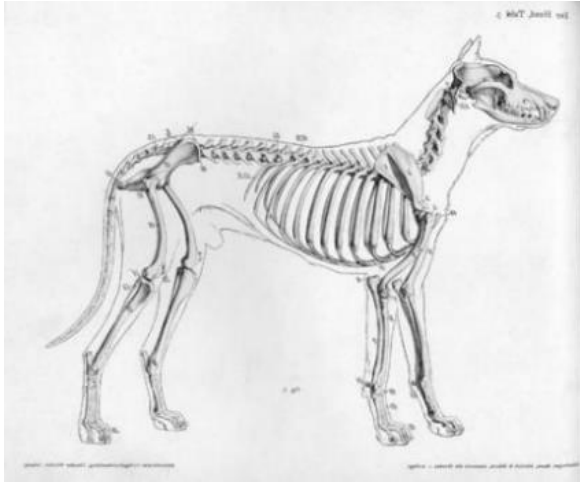
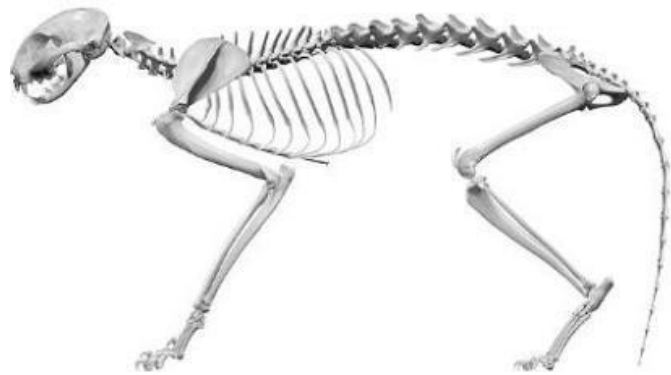


Image in Public Domain

As with horses, pigs, cows and sheep, dogs do not have clavicles. They share the same ability as horses to gain longer stride for running and jumping with their “floating limbs”. Again, there is no hard attachment to the skeleton that would enable us to use the legs as handles.

Cats are special, they have a remnant of clavicle, but this is not attached to any other bone and seems to be non-functional. The cat’s skeletal structure explains their extraordinary ability to leap and run.



Whole Cat Skeleton by Hiroshi Mamiya

Note that the space between the vertebrate, even greater with the dog’s, allows flex and twist, and can challenge the security of strapping and slinging of these animals. Because of this, choose species, breed and size specific/appropriate harnesses, bags, or crates for lifting.



Images in Public Domain



The golden poodle on the left has more protection for his nerves, muscle and bones than the Doberman on the right. If they needed to be lifted, the poodle would likely be safe in an improvised vertical lift tie, whereas the Doberman may require a breed and size specific harness, or crate.

Many dogs realize that the rescuers are there to help, and so are compliant.



Photo Creative Commons



Lucas County Pit Crew

Others appear to be exhausted, but with a shot of adrenaline upon rescue, this dog may still have the energy to be defensive.

Patient Management

What does everyone feel comfortable with? Consider safety, can you control the scene? Can you contain the animal if the handler loses control? Can you sedate? If the animal must be immobilized do you have the ability to work with that? What is safer for the rescuers, what is



Photo Getty Images

better for the animal? Refer to first aid for muzzling with gauze, vet wrap, 1" web etc.



FEMA Photo by Elissa Juh

Read the animal, read the signs, some dogs require expert handlers.

Can you set things up so that the animal can save itself?

What is the animal capable of?



Photos Creative Commons

If dogs can bring a flotation ring to a human for rescue, perhaps a flotation ring could be thrown to a stranded dog to grab on to.



It seems a dog will follow his nose anywhere. This common rescue seems straightforward, but realize the dog will need a veterinarian to supervise or perform extrication and to follow up with treatment.

Photo by Michael Stornetta



Photo by Michael Stornetta

This same dog was transported to the clinic in the fire engine. Note the vet wrap around the nose as a make shift muzzle.



The plastic bumpers on cars these days are intended to absorb the shock of collision. Impact sent this dog into the bumper where he remained until arrival at a veterinary clinic.

Photo Imagine China

Italian Fire fighters were able to rescue a dog out of the rubble of an Italian earthquake. He was heard barking 9 days after the quake struck. His rescue became a symbol of hope.



Photo Creative Common

Dogs and other small animals may require DECON after being rescued from rubble or disaster. In this photo, volunteers wash a dog who was a victim of a tornado.

Please note the lack of PPE



FEMA Photo by Jocelyn Augutino

Lifting Dogs



Photo Michael Stornetta



Photo Creative Commons

Lifting is routinely practiced by USAR teams with USAR dogs. USAR teams are best qualified to lift small animals. Both of the dogs in these pictures seem comfortable with operations, the result of training. Responders who lift as a means of extrication or rescue would need to accommodate anxiety and agitation of the animal patient with the supervision of a veterinarian.

Chapter 13 – Euthanasia

At the end of this topic, a student, given considerations and consequences of euthanasia decisions, will be able determine potential need for euthanasia of the animal patient, determine acceptable methods of euthanasia, so that potential danger to bystanders is reduced, incorporating sheltering in place and delivering comfort care until field euthanasia can be accomplished by a qualified individual.

Disclaimer

The intent of this section is to give initial responders a basic understanding of animal euthanasia. Please understand that this is by no means a full discussion of animal euthanasia. We encourage you to pursue further training from a certified source prior to engaging in euthanasia procedures.

Euthanasia: The act or practice of killing or permitting the death of hopelessly sick or injured individuals (animals) in a relatively painless way for reasons of mercy
Merriam-Webster Dictionary

A “Good Death”

Although Euthanasia may be a troubling subject, euthanasia procedures may be necessary in the course of an ATR. The term is derived from the Greek terms **Eu** meaning good and **Thanatos** meaning death.

Patient Assessment

The reason for euthanasia might not be readily apparent. Rescuers can gain clues to the animal's condition by observing odd behavior or attitude, obvious physical signs, substantial loss of blood, and by understanding mechanism of injury that may point to internal injuries.

Reasons for Euthanasia

General assessment may reveal specific reasons for euthanasia. These include:

- **Terminal illness** such as cancer or a neurological disease
 - Some of these illnesses are not going to be visible and may have been progressing for a long time
 - Rabies
 - A public health-risk
 - Abnormal behavior; aggressiveness, lethargy, frothing, excessive salivation, seizures....
 - Utilize Animal Control or veterinary personnel for euthanasia if possible
 - Maintain integrity of the skull and tissue, use caution handling the carcass

- Limit the number of individuals having exposure
- Immediately submit to Public Health Laboratory for testing.
- **Physical injuries/severe traumatic injury**
 - major limb fracture, multiple limb fracture
 - broken neck/back
 - severe lacerations with blood loss
 - major tendon or muscles damaged
 - catastrophic spinal injury / broken neck or back
 - severe surface burns > 50% body surface
 - profound head trauma / brain damage
 - evisceration intestines or other organs protruding from body
 - prolonged smoke/toxic chemical inhalation

Who Performs Euthanasia?

Emergency responders, depending on agency policy, may have authorization to euthanize an animal as per applicable laws, situational assessment, local or state agency, insurance company, and/or owner consent. Always attempt to contact a veterinarian before any euthanasia, if at all possible, contact a species-specific vet. When dealing with a large animal, veterinarians may know all species however they will tend to specialize, generally in cattle or horses. It is highly recommended that agencies maintain 6-12 emergency contact numbers for veterinarians in the region or state who are available to assist and establish MOU's with these resources.

Why Qualified Responders Should Be Prepared to Take Action

The type of trauma or other mechanism that warrants euthanasia can easily escalate the emotions of the owners, handlers and you. No one wants to see an innocent animal suffer. Euthanasia is performed to end pain and suffering specifically when recovery and quality of life issues are evident. **If there is no agency on scene that is authorized to perform euthanasia, then responders must be prepared to shelter and comfort the animal until that authority arrives.**



In this photo of a fallen police horse, the officer has the ability to perform euthanasia, but instead, calms and comforts the horse and waits for a veterinarian's assessment.

Photo American Justice League, photographer unknown

If you find yourself in this position, try to control your emotions and keep the scene calm. Anyone who is emotionally unstable will transmit that to the animal. Remove them from the scene.

Animal Management in the Decision-Making Period

Keeping the animal calm is very important for rescuer safety. An owner that is not too distraught, will have the ability to calm the animal. Reassure the animal with a calm voice and firm but gentle hand. If the animal is agitated, consider using a blindfold or ear plugs to make it less reactive, but know that research indicates that blindfolds increase the heart rate, indicating stress.¹

If the animal is down, in general, it is desirable to keep them down to prevent further injuries and rescuer safety. With a large animal, restrain head laterally on ground (protect head with padding). Caution, horses have the strength to throw a person who is trying to restrain them. Only attempt this if you have specific training.

Restrain head sideways with chin to chest if animal is up on **chest** **If the animal is calm, there is no need to restrain.** Distract the animal with stroking and food. If the animal is calm while standing, consider the same approach. Shield the animal from outside disturbances that might be frightful.

¹ Equine Science Update "Do Blindfolds Calm Horses?" 2001 – 2007
<http://www.equinescienceupdate.com/articles/blindfold.html>

If animal is coping, delay euthanasia decision until veterinarian arrives!

Reducing stress is a key factor. Human presence may be reassuring to some dogs, cats, horses and dairy cattle. Range cattle and wild animals are not used to humans, our proximity can antagonize and stress them. Because of this consider their flight response prior to euthanasia. Do not drag live animals for convenience prior to euthanasia.

There are several aspects to consider when thinking about euthanasia. These include;

Is public safety at risk?

Is the animal suffering?

If using a firearm, is the person qualified to perform humane euthanasia?

What are the surroundings and surfaces?

In the photograph above, the cow is about to be shot as a danger to the public. Be sure that all other means of containment have been



Photo Idaho State Journal



Photo Elizabeth Goldberg

attempted. Luring with hay, or herding into a stock trailer are all possible options to protect a rancher's investment.

Be aware of public perception and potential ramifications. It is crucial that a qualified PIO be present to handle the public aspects.

Consider this photo of a New York City Police Horse that fell through this drain cover.

The photographer has captured the bond between horse and rider and she gives us a glimpse of the profound impact euthanasia could deliver to all those involved.....most importantly the owner, the responders, the public on-lookers, and the person performing euthanasia. Thankfully, this horse was able to be rescued, but at the time, the officer thought that the back legs were most likely broken.

Euthanasia Considerations

Once euthanasia has been determined, there are several aspects that need to be attended to. Attempt to get written consent from owner. The owner has the final say. If the owner is not available, the decision will pass to the agency with jurisdiction, as determined according to state, local protocols. Most importantly, Document, Document, Document who, where, why, the more detail the better. If possible, take photos or video documentation of the scene and injuries.

If the decision is made to euthanize the animal, the method of humane euthanasia is species specific. Select the method with regard to public perception, public & responder safety, and effectiveness. *The decision must be made with the highest ethical standards and social conscience.*

Acceptable Methods of Euthanasia

Acceptable techniques, per AVMA guidelines include;

- **Lethal injection**, limited to veterinary personnel, possibly Animal Control
 - Profound general anesthesia with continuation to death
 - Loss of consciousness
 - Requires close proximity and/or contact with the animal
 - Tranquilizers can be pre-administered
 - Requires strict removal/handling of carcass to protect the environment and wildlife
 - May induce excitement, vocalization, muscle contractions, urination/defecation

Death occurs secondary to suppression of the brain, heart and lungs.

- **Gun shot**
 - Can be performed by veterinarian, law enforcement with training
 - Physical disruption of brain activity
 - Loss of consciousness with 30% disruption of brain stem
 - Erratic behavior if not done properly
 - May have exaggerated muscle activity
 - Caliber is not as crucial as appropriate shot placement
 - 1-3 feet from target
 - Angle of entry between perpendicular and 70 degrees
 - Anticipate the bullet's path



Photo Howard Ketover, DVM

- **Captive bolt to the brain (pithing tool is mandatory with use of captive bolt).**
 - A species specific captive bolt must be used
 - As with other techniques, can be cruel if not done effectively

See Temple Grandin for additional information

While captive bolt is a contained method that poses little risk for the responders, if it is not done properly, it can cause the animal to be fractious and become a danger. There are numerous captive bolts available that are designed for specific species. It is critical to understand that a captive bolt requires the use of a pithing tool to complete the euthanasia. The captive bolt itself is designed to damage the brain and allow the circulatory system to bleed the animal out.

All of these methods should only be performed by people specifically trained in that technique.



Ofc. Dana E. Paladini
CHP - South Los Angeles

Officer Dana E. Paladini and a sheriff's deputy arrived at the scene of a vehicle accident involving a horse trailer. One animal suffered a broken leg, and the owners asked the officers to shoot the horse. The deputy sheriff fired three shots - one ricocheted off the trailer wall striking Officer Paladini, who died shortly afterward. The 25-year-old patrol officer had been a member of the CHP for only nine months.

End of Watch: July 4, 1972

Other techniques are available but may not be indicated in emergency rescue situations. As in any situation where euthanasia is prescribed, consideration needs to include public perception. A trained PIO can convey for the press, a quick, capable relief of the animal's suffering.

Confirmation of Unconsciousness and Death

Once the decision to euthanasia an animal is made, it must include rescuer safety and the effectiveness of the selected method. Effectiveness must be confirmed. This confirmation can include:

- Immediate collapse of the animal
- Rigid muscles followed by muscle tremors
 - can result in violent reactions that can pose a danger to rescuers
- Respirations and heart beats stop
 - Can be so shallow that untrained rescuers may miss them
- Corneal reflex is a more reliable indicator
 - Direct contact with eye with no reaction is the most reliable indicator

Difficulties with Euthanasia

Euthanasia can be a difficult event; there are strong emotional ties between the owner and the animal, no matter the size. Given that horses can live into their 40's, this tie can be substantial. Owners may feel guilt, loss of their best friend, and a financial loss. For rescuers, who are trained to save lives, these situations can be traumatic requiring critical stress debriefing (CSD).



Photo Debra Fox

It is not uncommon for an animal to get hit by a vehicle. In this situation, a horse was hit by a car in a residential neighborhood. The horse suffered severe injuries that led to euthanasia in a public place. Don't underestimate the impact of this type of ATR incident, and encourage CSD.

Additional resources;

AVMA Guidelines for the Euthanasia of Animals: 2013 Edition,
<https://www.avma.org/kb/policies/documents/euthanasia.pdf> 102 pages

<http://vetmed.iastate.edu/humaneeuthanasia>

J. K. Shearer, DVM, MS Iowa State University, College of Veterinary Medicine, jks@iastate.edu

Temple Grandin Recommended Captive Bolt Stunning Techniques for Cattle, October 2014

<http://www.grandin.com/humane/cap.bolt.tips.html>

Chapter 14 – Recovery

At the end of this topic, a student, given benefits of recovery, will be able to describe reasons or methods that help out, so that both the recovery of an animal and the owners can benefit with a successful ATR recovery.

An animal that has been euthanized or has otherwise died may need to be removed from the scene to a place where it can be staged for pick up or burial. In the photo at the right, a horse that was struck by a car is loaded onto a backboard for removal from the busy, residential street.



Photo by Debra Fox

Unfortunate as the situation is, it does afford rescuers the opportunity to practice skills on a real animal. This **MUST** be done in a dignified manor for the sake of the owners and the public. Observe proper safety techniques and equipment placement.

Recovery represents the final phase of “rescue”. It is a transition from a place of incapacitation to a resting place or final resting place. When rescuers participate in recovery, it allows the satisfaction that the animal is no longer trapped or suffering.

Recovery is best achieved by ATR personnel and organizations with pre- negotiated MOU’s and mutual aid agreements. As a public service, responders can use the opportunity to gain experience. They can transport the animal to an accessible location for pickup by crematories or rendering facilities. When performed with sensitivity, recovery will help retain some dignity for the animal and the owners will appreciate respectful handling of the body. DECON may also be necessary to clean the site of blood and tissue.



Photo Debra Fox

Recovery is practical.

An ATR team may be requested to perform recovery of a large animal out of a watershed, or other area that is inappropriate for burial or abandonment. It is of great benefit to the animal owner, as well as the jurisdiction where the animal died, be it a park or utility district.

Train trestle wrecks are unexpectedly common, as owners take shortcuts across train trestles.



Photo by Pat Verhuel

We never hear about the times they make it across safely, we only hear about the times the horse slips and gets its hoof stuck in between the ties and has to be put down. These are complex incidents, especially when it occurs on an active track. Special resources, available from the railroad company may be necessary. One useful piece of heavy equipment is a backhoe on rail wheels, a special type of “High Rail” vehicle with lift capability. If this vehicle is not rated for the heavy load of a horse or cow, it might be possible to anchor it in place. Once securely anchored, the lift can be used to transfer the victim to a High Rail flatbed for transport to an intersection on the track with horse trailer access. On active railways, rescuers make it possible for service to resume more quickly.

Rescuers who are tasked with recovery of a victim might take comfort in the fact that they have been able to help the owner, and the horse after the fact. On another level, it is additional experience in the application of ATR skills that will then help to save another horse at another time.



Photo Austin Schumacher

Y.C.O.D.W.Y.C.D.Y.C.D.A.M.T.T.

The longest acronym in the fire service.... "You can only do what you can do, you can't do anything more than that". Today you know more than you did yesterday, and the next time, what you learned will help to save another animal.

Resources

Topic 1 - Introduction and History

- Key words to search on include: Horses in the Fire Service, Mules in Mines, Transport of War Horses, The Bible, Luke 14 verse 5

Topic 2 – Animal Anatomy / Physiology

- Key words to search on include: Equine anatomy

Topic 3 – Safety and Approach

- Key search words, Reading Equine Body Language
- www.thehorse.com, www.equusmagazine.com
- “Speak Horse” by Ray Berta 2002

Topic 4 – Patient Management

- Key words to search on include: chemical restraint, horse handling, Buck Brannaman, Tom Dorrance, Ray Hunt

Topic 5 – Animal First Aid

- Key search words: pet first aid, horse first aid, avma.org, humanesociety.org, redcross.org

Topic 6 – Scene Management

- U.S. Fire Administration courses on non-fire emergencies
- ICS 100, 200, 300, 800, 400 and NIMS E/L courses in All Hazards
- British Animal Rescue & Trauma Association

Topic 7 – Physics

- Key search words; the physics of rope rescue

Topic 8 – Raising and Lowering

- Key search words; rope rescue

Topic 9 – Vertical Lifting / Helicopter

- Care for Disabled Animals, Jerry Floyd
- CA State Fire Training FSTEP Large Animal Rescue Operational

Topic 10 – Mud, Water, Ice Operations

- Key search words, mud rescue, mud lances, ice trenching

Topic 11 – Animal Decontamination

- Key search words; Haz mat, animal decontamination

Topic 12 – Small Animals

- Key search words; dogs in service, dog rescue







Topic 13 – Animal Euthanasia

- Key search words: euthanasia, AVMA accepted methods of euthanasia

Topic 14 – Recovery

- Key search words: HSUS, ASPCA, recovery

Strapping

 <p>Rotating</p> <ul style="list-style-type: none"> • Rescue strap is pulled in to the front door with a 1" web (anti-slip line) • The ground loop is positioned under the animal close to the withers • The top loop is fed through the ground loop and choked up snug • The rescue strap is drawn back over itself to the opposite side 	 <p>Rotating (continued)</p> <p>While one rescuer stabilizes the web, the other rescuers pull on the strap to rotate the animal to a sternal position</p>	 <p>Stay out of the legs!!! Watch for trip hazards!!!</p> <p>Rolling</p> <ul style="list-style-type: none"> • Rescue strap is see sawed or placed under the ground legs of a recumbent horse • The ends of the strap are wrapped at the gaskin and the chest • The loop ends of the strap are pulled to roll the horse
 <p>Side Drag</p> <p>Strap brought through the front door & the back door each</p> <ul style="list-style-type: none"> • Basket or Bight the ground legs (go over them) • Tuck the outer strap under the body as shown 	 <p>Back Drag</p> <ul style="list-style-type: none"> • Rescue strap is brought through the back door • The working end of the strap is passed over the flank and passed in between the back legs for attachment to the cut away 	 <p>Front Haul</p> <p>Rescue Strap is brought through the front door until loop reaches the sternum</p> <ul style="list-style-type: none"> • Other loop is passed through the sternal loop to form a choker and passed through the front legs for attachment to a cut away and haul system

References

Topic 1 - Introduction and History

- History of Campbell County “Sure-footed, Sturdy Mules, Stabled Underground, Often Used to Haul Coal Cares inside Mines” by Dallas Bogan, The LaFollette Press
- The Role of Horses in World War One by Alexander Collin ([HTTP://Madefrom.com/history/author/alexander-james/](http://Madefrom.com/history/author/alexander-james/))
- The Aztec Treasure House
- Aurora Regional Fire Museum youtube Fire fighting in the Horse Drawn Era

Topic 2 – Animal Anatomy / Physiology

- Equine Anatomy for Emergency Responders by Dr. Deb Bennett, PhD
- Notes for Large Animal Rescue by Anne Terry, DVM
- Biosphera 3-D Horse Anatomy
- Joints and Ligaments – Horse anatomy WikiVet Budra, K. Sack, W.O., Anatomy of the Horse, 6th edition (2012), Schlutersche Verlagsgesellschaft

Topic 3 – Safety and Approach

- CA State Fire FSTEP course Large Animal Rescue Operational
- Enrichment: Buck Brannaman, Ray Hunt, Mark Rashid, Ray Berta

Topic 4 – Patient Management

- CA State Fire Training FSTEP course Large Animal Rescue – Operational
- Equine Science Update 2001-2017 “Do Blindfolds Calm Horses?”

Topic 5 – Animal First Aid

- Howard Ketover, DVM Madison, WI

Topic 6 – Scene Management

- CA State Fire Training FSTEP Large Animal Rescue - Operational
- Hampshire Fire Brigade Operations Manual

Topic 7 – Physics

- Brad Silen Physics applied to Animal Technical Rescue

Topic 8 – Raising and Lowering

- CA State Fire FSTEP Large Animal Rescue – Operational
- Considerations for Rope Rescue by Kenneth Laidlaw 2016 web version

Topic 9 – Vertical Lifting / Helicopter

- CA State Fire FSTEP Large Animal Rescue – Operational
- Arizona Equine Rescue Organization AERO
- UC Davis VERT demonstration
-

Topic 10 – Mud, Water, Ice Operations

- CA State Fire FSTEP Large Animal Rescue – Operational

Topic 11 – Animal Decontamination

- Iowa State University Animal Decontamination Field Guide
- OSHA HAZWOPER 29 CFR 1910.120, 8 CCR 5192
- Toxicological agents of concern for search-and-rescue dogs responding to urban disasters Lisa A. Murphy, vms; Sharon M. Gwaltney-Brant, dvm; PhD, DABVT; Jay C. Albretsen, DVM, PhD, DABVT; Tina A. Wismer, DVM

Topic 12– Small Animals

- Basic Animal Emergency Services by American Humane Red Star Animal Emergency Services 2010
- The Expendables: Inside America’s Elite Search and Rescue Dog Training, The BuzzFeed, Joe Flood, <https://www.buzzfeed.com/joeflood/the-expendables-inside-americas-elite-search-and-rescue-dog>

Topic 13– Animal Euthanasia

- Howard Ketover DVM Madison WI
- Western University Veterinary School
- CA State Fire Training FSTEP Large Animal Rescue Operational
- Temple Grandin “Recommended Captive Bolt Stunning Techniques for Cattle” Oct. 2014 <http://www.grandin.com/humane/cap.bolt.tips.html>

Topic 14 – Recovery

- CA State Fire Training FSTEP Large Animal Rescue Operational

NFPA Correlation

NFPA 1670 2014 Edition, Technical Rescue Standard; Animal Rescue Technical Rescue, Chapter 17 Correlation Guide

17.3 Operational Level

Performance Requirement Reference	Learning Objective	Chapter
17.3.1	Organizations performing animal rescues at the operational level shall meet all requirements of sections 17.2 and 17.3	
17.3.1 (1)	Identifying hazards to rescuers posed by the animal (perform risk assessment)	3, 4, 6
17.3.1 (2)	Identify behavioral body posture cues to determine the disposition of the animal	2, 12
17.3.1 (3)	Creating an improvised restrain device (to include an improvised muzzle) to establish physical restraint/control of an animal, both ambulatory and non-ambulatory	8, 9
17.3.1 (4)	Identifying appropriate attachment points to the animal, and appropriate positioning of the animal for extrication with minimal injury to the animal and responders	2, 4, 8, 9
17.3.1 (5)	Using a harness, halter, leash, webbing, sack or cage, whether improvised, custom or commercially manufactured, to assist in the movement of an ambulatory animal from one stable location to another in a low-angle environment	8, 9, 10
17.3.1 (6)	Using an animal packing device or system to move a recumbent animal from one stable location to another in a low-angle environment	8, 9, 10, 12
17.3.1 (7)	Performing a low-angle and high-angle lower and raise of an animal using a improvised, custom or commercially manufactured system, to include safely accessing, managing and packaging the patient	8, 10, 12
17.3.1 (8)	Recognizing and calling for when chemical restraint is needed or contraindicated	4
17.3.1 (9)	In mud rescue or other adhesive material environments, recognizing the need to alleviate suction on an animal's limbs	10
17.3.1 (10)	Using behavioral cues and "fight or flight" or "tipping point" behavior characteristics to assist in a rescue	2, 4

17.3.1 (11)	Using containment techniques for animals that cannot be immediately handled or which require greater control and attention to behavior	6
17.3.1 (12)	Operate a ladder to access animals from a location below or above grade	8
17.3.1 (13)	Perform basic first aid to animal using species-appropriate techniques	5
17.3.1 (14)	Utilize auxiliary equipment to facilitate the safe placement of rescue devices on the animal	8, 9, 10

NFPA 1670 2014 Edition, Technical Rescue Standard; Animal Rescue Technical Rescue, Chapter 17 Correlation Guide

17.4 Technician Level

Performance Requirement Reference	Learning Objective	Chapter
17.4.1	Organizations performing animal rescues at the operational level shall meet all requirements of sections 17.2, 17.3 and 17.4	6
17.4.3 (1)	Using a designed and tested harness device designed for animals and extended use in the high-angle environment to include helicopter rescue	8, 9
17.4.3 (2)	Performing a high-angle rope rescue of an animal suspended from or stranded on a structure or landscape feature	7, 8, 9
17.4.3 (3)	Using rope rescue systems to move an animal along a horizontal path above an obstacle or projection	7, 8, 9
17.4.3 (4)	Understanding and applying the principles of the physics in constructing rope systems, including system safety factors, critical angles and causes and effects of force multipliers	7
17.4.3 (5)	Performing a high-angle rope rescue with an animal litter or sling system using tender(s) to negotiate obstacles, or manipulate, or position the animal	7, 8, 9
17.4.3 (6)	Moving an animal packaged in an animal litter or sling system up and over an edge during a raising or vertical lift operation with a rope system	7, 8, 9, 10
17.4.3 (7)	If performing rescue of animals that have broken through ice on frozen bodies of water, the animal rescue team at the technician level shall develop and implement procedures for cutting a path through ice and providing water rescue, or performing a sideways drag with edge protection or cantilevering of the animal to safety	10
17.4.3 (8)	Understanding all dynamic loads associated with animal behaviors in a rope rescue system, and recognizing small livestock and smaller animals will be within the two-person rescue load normally used for human rescue	7, 8, 9
17.4.3 (9)	Understanding the hazards to animals and responders in trailer extrication, and it meeting the OSHA definition of a confined space	6

17.4.3 (10)	Performing helicopter rescue with a specifically designed and tested extended lift harness	9
17.4.3 (11)	Performing animal decontamination as a component of a rescue (sewers, canals, or other hazards) with recognition of hazmat issues	11

Acronyms & Abbreviations

AC or AS: Animal Control or Animal Services
AHJ: Authority Having Jurisdiction
ATR: Animal Technical Rescue
AVMA: American Veterinary Medical Association
CERT: Community Emergency Response Team
CDC: Center for Disease Control
CFSAN: Center for Food Safety & Applied Nutrition
Decon: Decontamination
DHS: Department of Homeland Security
EOC: Emergency Operations Center
EOP: Emergency Operations Plan
EPA: Environmental Protection Agency
EVAC: Evacuation
FDA: Food & Drug Administration
FEMA: Federal Emergency Management Agency
FSA: Farm Service Agency
IAP: Incident Action Plan
ICS: Incident Command System
ICP: Incident Command Post
ILT: Instructor Led Training
IMS: Incident Management System
HAZMAT: Hazardous Materials
LAR: Large Animal Rescue
MOU: Memorandum of Understanding
NAHLN: National Animal Health Laboratory
NGO: Non-governmental Organization
NIMS: National Incident Management System
OES: Office of Emergency Services
Ops: Operations
PIO: Public Information Officer
PPE: Personal Protective Equipment
ROSS: Resource Ordering and Status System
SEMS: Standardized Emergency Management System
SME: Subject Matter Expert
USDA: United States Department of Agriculture
VMAT: Veterinary Medical Assessment Team

WIFSS: Western Institute for Food Safety & Security

YCODWYCD-YCDAMTT: You Can Only Do What You Can Do – You Can't Do
Anything More Than That
